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ABSTRACT

To improve female students' attitudes toward mathematics and to increase the enrollment of females in upper level mathematics courses, students enrolled in grade 10, 11, and 12 at A. Y. Jackson Secondary School were placed in sex-segregated math classes. This study focused on four main areas: attitudes, achievement, enrollment, and perceptions of the program. The longitudinal analysis of the attitudes for students provided very little evidence that segregated classes had a beneficial effect on female students' attitudes. The pattern of changes in final mathematics grades differed for the sex-segregated and the comparison groups of students. The possible reasons are discussed. The degree of enjoyment and challenge in math and perceptions of the usefulness of math declined over time to a significantly greater degree for A. Y. Jackson students than for students at the comparison school. Although a sizeable proportion of all A. Y. Jackson students felt that the program had no effect on their attitudes toward, or achievement in mathematics, males were more likely than females to believe that segregated classes had a negative effect on attitudes and achievement; females were more likely than males to believe that the program had a positive or no influence on their attitudes and achievement. Appendices include student and parent questionnaires, interview materials, statistical tables, and responses to the questionnaires. (YP)

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EFFECT OF SEX-SEGREGATED MATHEMATICS CLASSES ON STUDENT ATTITUDES, ACHIEVEMENT AND ENROLMENT IN MATHEMATICS:

A.Y. JACKSON SECONDARY SCHOOL

YEAR III

Sandra Sangster

March, 1988

SE051251

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INTRODUCTION

Background

As part of a pilot program designed to improve attitudes toward mathematics, and to increase participation rates in mathematics for females, students enrolled in grade 10 advanced math classes at A.Y. Jackson S.S. in 1984-85 were placed in sex-segregated math classes. All students completed pre-post questionnaires assessing their attitudes towards mathematics. Students also completed the Mathematics Concepts and Applications sub-test of the Canadian Achievement Test (C.A.T.) at the end of the academic year. Year-end marks from grade 9 and 10 provided additional data on performance in mathematics.

The program of segregating advanced mathematics classes at A.Y. Jackson was extended to grade 11 in the 1985-86 academic year. Thus, students who participated in Year I of the study (Cohort I) and who continued to enrol in advanced mathematics were placed in sex-segregated classes in Year II. Because A.Y. Jackson became a semestered school in 1985-86, Cohort I students who completed their grade 11 advanced math credit in the first semester had the option of completing their grade 12 math credit in the second semester. These "fast-tracking" students contributed to the Year II data which was collected in the first semester. However, they were not part of the Cohort I sample for subsequent data collection since grade 12 advanced mathematics courses were not segregated in 1985-86. Further attrition of students from the Cohort I sample was attributable to students who were formerly enrolled in advanced math switching to the general math stream, either at the grade 11 or grade 12 level.

A second group of students who enrolled in grade 10 advanced mathematics in the 1985-86 academic year was also placed in sex-segregated classes. These students are referred to collectively as Cohort II. Cohort II students who completed their grade 10 math credit in the first semester had the option of completing their grade 11 advanced math credit in the second semester. Such students were placed in sex-segregated classes for both courses. A small number of these Cohort II students opted to switch to the general stream in the second semester and thus no longer formed part of the sample.

In order to determine the extent to which possible changes in attitudes, achievement levels and participation rates at A.Y. Jackson were the result of segregated classes, data were collected from students at another North York secondary school. The inclusion of this additional school provided a comparison group of students enrolled in non-segregated math classes who had also been assessed repeatedly on the same measures, and who were at the same grade level in a school with a similar socio-economic background and academic emphasis.

A report entitled "Effect of Sex-Segregated Mathematics Classes on Student Attitudes and Achievement in Mathematics: A.Y. Jackson S.S. Year I" provides detailed results for the first year of the program. A similarly titled report summarizes the results for the second year.

Purpose of the Study

Educational Research and Evaluation Services was requested to continue the evaluation of the effects of segregated classes at A.Y. Jackson. As in the first two years of the study, four questions provided the focus for data collection:

1. How are students' attitudes towards mathematics affected by segregated classes?
2. How is students' achievement in mathematics affected by segregated classes?
3. What are the reactions of students towards sex-segregated classes?
4. To what extent do sex-segregated classes change the participation rates of males and females in mathematics courses?

METHODOLOGY

The program of segregating advanced mathematics classes was extended to Grade 12 in the 1986-87 academic year. Thus, Cohort I students who continued to enrol in advanced mathematics were placed in sex-segregated grade 12 math classes in Year III. Fast-tracking Cohort I students who enrolled in grade 13 math in Year III were no longer part of the study sample.

Cohort II students who enrolled in grade 11 advanced mathematics in 1986-87 were also placed in sex-segregated classes. Cohort II students who fast-tracked by completing their grade 10 and 11 credits in 1985-86, and who enrolled in grade 12 math in 1986-87, were placed in segregated grade 12 classes. Because the number of fast-tracking Cohort II students was too low to permit statistical analysis, the grade 12 data from these students were excluded from the Cohort II longitudinal analysis of changes in math attitudes and final math marks. Data from fast-tracking Cohort II students were not grouped with the longitudinal analysis of Cohort I students' marks and attitudes since their experiences in the program appeared to differ.

It should be noted that there were significant personnel changes at A.Y. Jackson in 1986-87, the third year of the study. Only one female math teacher remained in the school. Of the others who were at the school in the first two years of the study, one changed boards, another changed schools and the remaining two were declared surplus due to declining secondary school enrolments. As a result, the majority of female students were taught by male teachers in the third year of the study. In Years I and II, by far the majority of female students were taught by female teachers, whereas virtually all male students were taught by male teachers.

Year III data were collected by staff of Educational Research and Evaluation Services in co-operation with teaching staff from A.Y. Jackson and the comparison school. Data collection procedures in Year III involved the following:

. Cohort I

- Attitude questionnaires were administered to Cohort I students at A.Y. Jackson who were enrolled in grade 12 advanced math, and to all students enrolled in advanced math in grade 12 at the comparison school, just prior to the end of the course (either December or May, 1986).

- Final math marks were compiled for students enrolled in grade 12 advanced math at A.Y. Jackson and the comparison school.

. Cohort II

- Attitude questionnaires were administered to Cohort II students at A.Y. Jackson who were enrolled in grade 11 advanced math, and to all students enrolled in grade 11 advanced math at the comparison school just prior to the end of the course (either December or May, 1986).

- Final math marks were collected for students enrolled in grade 11 advanced mathematics at A.Y. Jackson and the comparison school.

. Other Information

- Data were compiled regarding the 1986-87 enrolment by sex in mathematics courses at A.Y. Jackson and the comparison school.

The Attitude Questionnaire

The attitude questionnaire used in Years I and II was again used to assess attitudes which have been hypothesized to be related to the learning of mathematics. The scale consists of 51 items selected from the Fennema-Sherman Mathematics Attitudes Scales. High scores reflect positive attitudes towards mathematics. The scales which are derived from these items include the following:

. Attitude toward success in mathematics scale
. Mathematics as a male domain scale
. Mother scale
. Father scale
. Confidence in learning mathematics scale
. Mathematics anxiety scale
. Effectance motivation scale in mathematics
. Mathematics usefulness scale
. Teacher scale

Further details regarding the theoretical basis for these scales is provided in the literature review (Appendix A) of the report from Year I, with information regarding scoring of this measure found on pages 3 and 4 of the Year II report.

In the second part of the attitude questionnaire, students were asked to comment on:

- factors affecting students' attitudes toward and achievement in math
- decisions to continue enrolling in math
- the importance of female math teachers for female students
- the extent of career information provided by math teachers
- future educational and career plans.

All grade 12 students were asked to indicate which grade 13 math courses they planned on taking. Students at A.Y. Jackson were also asked to discuss the effects of sex-segregated classes and their experiences in those classes. A copy of the attitude questionnaire may be found in Appendix A.

Participants

The following tables indicate the total number of grade 11 and 12 students who completed the attitude survey in Year III or for whom final math marks were available. The longitudinal analyses of changes in math attitudes and marks reported in subsequent sections are based on substantially fewer cases due to incomplete data.

Attitude Survey

	Cohort I: Grade 12			Cohort II: Grade 11		
School	Male	Female	Total	Male	Female	Total
A. Y. Jackson	131	127	258	145	137	282
Comparison School	118	105	223	130	149	279

Final Math Marks

	Cohort I: Grade 12			Cohort II: Grade 11		
School	Male	Female	Total	Male	Female	Total
A. Y. Jackson	151	129	280	172	149	321
Comparison School	157	123	280	144	175	319

RESULTS

The results for 1986-87, the third year of the study, are presented in the following four sections:

I. Student Attitudes Towards Mathematics

II. Student Achievement in Mathematics

III. Student's Perceptions of the Impact of Sex-Segregated Classes and Future Plans

IV. Student Participation Rates in Mathematics

I. STUDENT ATTITUDES TOWARDS MATHEMATICS

Mathematics Attitude Scales

Students were asked to indicate the extent to which they agreed or disagreed with a series of statements regarding their attitudes towards mathematics. Responses were assigned a score from one to six, with higher scores reflecting more positive attitudes.

An analysis of the data was carried out with the assistance of staff at the Institute for Social Research, York University. Average scores were calculated for each of the nine attitude scales and comparisons were made between the scores of males and females at each school as well as between the scores of students at A.Y. Jackson and the comparison school.

Cohort I

Repeated measures analyses were carried out to examine the influence of sex, school and time on attitudes. Appendix B summarizes the significance tests for the individual attitude scales. The analyses were based on 179 students who completed the questionnaire at the end of grades 10, 11 and 12, and who provided their names so that data from the three administrations could be matched. The sample can be broken down as follows:

School	Female	Male
A.Y. Jackson	51	50
Comparison School	39	39

On the tables that follow average scores are listed for each of the attitude scales. Where there are statistically significant differences between scores (measured at the .05 probability level) these are discussed, otherwise it may be assumed that the scores are not significantly different. It should be noted that most scores are relatively high, thus indicating that the students generally held very positive attitudes towards mathematics.

The average scores for the grade 10, 11 and 12 administrations are plotted separately for each of the attitude scales in Figures 1 - 5 of Appendix B.

a) Attitude Towards Success in Mathematics Scale

The Attitude Towards Success in Mathematics Scale was designed to measure the degree to which students anticipate positive or negative consequences as a result of success in mathematics. Students demonstrate a fear of success by anticipating negative consequences or by lack of acceptance or responsibility for the success, e.g. "It was just luck."

	A.Y. JACKSON			COMPARISON		
Sex	Grade 10	Grade 11	Grade 12	Grade 10	Grade 11	Grade 12
Female	5.26	5.36	5.41	5.30	5.28	5.29
Male	5.05	4.99	5.14	5.10	4.89	4.91

Females at both schools were significantly more likely than males to anticipate positive consequences as a result of success in mathematics. No differences were found between students at the two schools or between testings. There was a tendency (of borderline statistical significance) for A.Y. Jackson students to become more likely to anticipate positive consequences by the end of grade 12.

b) Mathematics as a Male Domain Scale

The Mathematics as a Male Domain Scale is intended to measure the degree to which students see mathematics as a male, neutral or female domain in the following ways:

- the relative ability of the sexes to perform in mathematics
- the masculinity/femininity of those who achieve well in mathematics
- the appropriateness of this line of study for the two sexes.

	A.Y. JACKSON			COMPARISON		
Sex	Grade 10	Grade 11	Grade 12	Grade 10	Grade 11	Grade 12
Female	5.65	5.75	5.78	5.63	5.73	5.71
Male	5.25	5.18	4.95	5.32	5.12	5.14

Females at both schools were significantly more likely to see mathematics as being equally suitable for men and women than were male students. Between grades 10 and 12, females at both schools became more likely to see math as appropriate for women. Males at both schools became more likely to see math as a male domain (low scores).

c) Mathematics Anxiety Scale

The Mathematics Anxiety Scale is intended to measure feelings of anxiety, dread, nervousness and associated bodily symptoms which are related to working on mathematics. The dimension ranges from distinct anxiety (low scores) to feeling at ease (high scores).

	A.Y. JACKSON			COMPARISON		
Sex	Grade 10	Grade 11	Grade 12	Grade 10	Grade 11	Grade 12
Female	4.43	4.47	4.45	4.15	4.06	3.88
Male	4.21	4.25	4.20	4.28	4.35	4.12

Females at the comparison school appeared to be more anxious about math than females at A.Y. Jackson particularly in grades 11 and 12, whereas males at the two schools scored similarly. This apparent difference in the scores of females at the two schools was not large enough to provide strong evidence that the program benefitted females at A.Y. Jackson since the differences were not statistically significant.

d) Confidence in Learning Mathematics Scale

The Confidence in Learning Mathematics Scale is intended to measure confidence in one's ability to learn and to perform well on mathematical tasks. The dimension ranges from distinct lack of confidence to definite confidence.

	A.Y. JACKSON			COMPARISON		
Sex	Grade 10	Grade 11	Grade 12	Grade 10	Grade 11	Grade 12
Female	4.85	4.84	4.73	4.69	4.60	4.23
Male	4.89	4.88	4.67	4.84	4.88	4.69

Students of both sexes became significantly less confident about their ability to learn math over time. This change over time was similar at the two schools, although the decline in confidence was somewhat greater for females at the comparison school by the end of grade 12 than for any of the other students.

e) Teacher Scale

The Teacher Scale was designed to measure students' perceptions of their teachers' attitudes towards them as learners of mathematics. It includes the teachers' interest, encouragement and confidence in the student's ability.

	A.Y. JACKSON			COMPARISON		
Sex	Grade 10	Grade 11	Grade 12	Grade 10	Grade 11	Grade 12
Female	4.68	4.61	4.32	4.44	4.42	4.10
Male	4.31	4.24	4.26	4.49	4.42	4.15

The perceptions of males and females did not differ significantly, nor did the attitudes expressed by students at the two schools. For all groups of students, their perceptions of teachers' attitudes towards them as learners of mathematics became less positive over time. The change for males at A.Y. Jackson was less pronounced than for the other student groups.

f) Mathematics Usefulness Scale

The Mathematics Usefulness Scale was designed to measure students' beliefs about the usefulness of mathematics currently and in relationship to their future educational, vocational and other activities.

	A.Y. JACKSON			COMPARISON		
Sex	Grade 10	Grade 11	Grade 12	Grade 10	Grade 11	Grade 12
Female	5.34	4.93	4.67	5.07	4.98	4.73
Male	5.31	4.88	4.69	4.96	4.94	4.94

There were no significant differences between males and females. However, perceptions of the usefulness of math declined over time to a significantly greater degree for A.Y. Jackson students (of both sexes) than for students at the comparison school. The perceptions of comparison school males showed virtually no change over time. All remaining students expressed similar views in grade 12.

g) Effectance Motivation Scale in Mathematics

The Effectance Motivation Scale in Mathematics ranges from lack of involvement in mathematics to active enjoyment and seeking of challenge.

	A.Y. JACKSON			COMPARISON		
Sex	Grade 10	Grade 11	Grade 12	Grade 10	Grade 11	Grade 12
Female	4.25	4.03	4.02	3.91	4.04	4.01
Male	4.05	3.68	3.81	3.88	3.87	3.88

The attitudes of males and females at the two schools did not differ significantly on this scale. However, the pattern of changes that occurred over time differed at the two schools. A.Y. Jackson students of both sexes expressed less enjoyment and seeking of challenge in mathematics over time. Students at the comparison school showed little change. The different patterns of change over time at the two schools reflects the fact that the attitudes of A.Y. Jackson students were initially more positive (in Grade 10), but by grade 12 were similar to the attitudes of comparison school students.

h) Mother and Father Scales

The Mother and Father Scales were designed to measure students' perceptions of their mothers'/fathers' interest, encouragement and confidence in their ability in mathematics. They also include the students' perceptions of their mothers'/fathers' examples as individuals interested, confident and aware of the importance of mathematics.

FATHER SCALE

	A.Y. JACKSON			COMPARISON		
Sex	Grade 10	Grade 11	Grade 12	Grade 10	Grade 11	Grade 12
Female	5.30	5.13	5.14	5.23	4.92	5.05
Male	5.23	5.28	5.08	5.21	5.13	5.18

There were no statistically significant differences in the attitudes expressed by males and females, or in the views of students at the two schools. There was a tendency (of borderline statistical significance) for the attitudes of all students to become less positive over time.

MOTHER SCALE

	A.Y. JACKSON			COMPARISON		
Sex	Grade 10	Grade 11	Grade 12	Grade 10	Grade 11	Grade 12
Female	5.32	5.29	5.20	5.19	5.18	5.08
Male	5.20	5.20	5.08	5.07	5.07	5.03

No significant differences were found between schools, males and females or over time.

Summary (Cohort I)

If segregated classes have a significant effect on student attitudes, differences in attitude scores would be expected between students at the two schools. These differences between schools might also be expected to vary over time and depend on the sex of the student. The longitudinal analyses comparing the grade 10, 11 and 12 attitudes of Cohort I students provided very little evidence that segregated classes have had a significant beneficial effect on female students' attitudes toward mathematics.

Although females at the comparison school appeared to be somewhat more anxious about math, less confident in their ability to learn math, and to feel that their teachers had less positive attitudes towards them as learners of math than females at A.Y. Jackson, particularly by the end of grade 12, such trends do not provide clear cut evidence that the segregated math program was of benefit to females at A.Y. Jackson since the differences were not large enough to produce statistically significant effects.

The degree of enjoyment and challenge in math and perceptions of the usefulness of math declined over time to a significantly greater degree for A.Y. Jackson students (of both sexes) than for students at the comparison school. However, it should be noted that at the end of grade 10 (the end of the first year in sex-segregated classes) A.Y. Jackson students regarded math as more useful and reported greater enjoyment and challenge than did comparison school students. By the end of grade 12, students at both schools expressed fairly similar attitudes on both the usefulness and effectance scales. Thus, there was no evidence that the program produced a lasting beneficial impact on attitudes for A.Y. Jackson students.

During the three years of the study, A.Y. Jackson students became somewhat more likely to anticipate positive consequences as a result of success in mathematics. The attitudes of comparison school students showed little change or became slightly more negative. The difference in trends over time at the two schools was of borderline statistical significance, providing little evidence of a strong impact of the segregated math program on the attitudes of Cohort I A.Y. Jackson students.

Cohort II

A complete description of the Cohort II results for the Attitude Scales may be found in Appendix C. The results provided no evidence that the sex-segregated mathematics classes led to more positive attitudes among the second cohort of students placed in the program. Contrary to expectations, A.Y. Jackson students of both sexes were more anxious about math and less confident in their abilities as learners of mathematics than comparison school students. Although some significant sex differences and changes over time were found, these tended to be similar for students at the two schools.

II. STUDENT ACHIEVEMENT IN MATHEMATICS

Analysis of Final Mathematics Marks

In order to examine the impact of both segregated classes and sex on student achievement, final mathematics marks were collected for students at both A.Y. Jackson and the comparison school. A summary table for the analyses of the final marks of Cohort I and II students is provided in Appendix D.

A longitudinal analysis of the final math marks of Cohort I students was conducted beginning with their grade 9 marks (prior to the implementation of the segregated math program) and including their marks in grades 10, 11 and 12. The purpose of this analysis was to determine whether there were significant differences between the sexes, between schools or significant changes in marks over time that were linked to sex or school. The sample of students included in this analysis was limited to the sub-group of students in grade 12 math in 1986-87 for whom grade 9, 10 and 11 marks were also available. The total sample of 245 is described below:

	A.Y. Jackson	Comparison School
Female	65	51
Male	71	58

A longitudinal analysis of the final math marks of Cohort II students was also done, beginning with their grade 9 marks and ending with their final grade 11 marks (representing two years in the segregated math program for students at A.Y. Jackson). This analysis was also designed to determine whether there were significant differences between the sexes, between schools or changes over time. The total sample of 482 can be broken down as follows:

	A.Y. Jackson	Comparison School
Female	109	147
Male	125	101

Cohort I

Average grade 9, 10, 11 and 12 final math marks for males and females at both schools are summarized below.

Average Final Mathematics Marks (%) *

Cohort I

	A.Y. JACKSON Grade				COMPARISON Grade			
Sex	9	10	11	12	9	10	11	12
Female	72	71	73	70	72	77	73	64
Male	70	67	68	65	68	74	70	63

* Because the longitudinal analysis of Cohort I students' final marks includes a subset of those students included in the Year I and II analyses, the average grade 9, 10, and 11 marks reported here differ somewhat from those previously reported.

Overall, females received significantly higher final marks than males. These differences were generally evident at both schools and all grades, although the sex difference in grade 12 at the comparison school was negligible.

The fluctuations and overall declines in marks that occured between grades 9 and 12 were significantly greater at the comparison school than at A.Y. Jackson. The pattern of changes in marks at the two schools is shown in Figure 1, Appendix D. Inspection of the graph indicates that the marks of females at A.Y. Jackson were more stable over time, ending up somewhat higher in grade 12 than the marks of the remaining groups of students (although there tendencies were not statistically significant.)

Cohort II

Average grade 9, 10 and 11 math marks for males and females in Cohort II at both schools are summarized below:

Average Final Mathematics Marks (%)

Cohort II

	A.Y. JACKSON Grade			COMPARISON Grade		
Sex	9	10	11	9	10	11
Female	71	67	65	73	70	70
Male	70	65	62	71	70	70

While there were no significant differences between females and males at either school, there were significant changes in marks between grades 9 and 11. Students' marks in grade 9 were fairly comparable, ranging from 70 to 73. Between grades 9 and 10 the marks of both males and females dropped significantly more at A.Y. Jackson than at the comparison school.

By grade 11, further declines in marks were noted for both males and females at A.Y. Jackson; no changes were found for comparison school students. The final math marks of Cohort II students are plotted in Figure 2 of Appendix D.

III. STUDENTS' PERCEPTIONS OF THE IMPACT OF SEX-SEGREGATED CLASSES AND FUTURE PLANS

Personal Impact of Segregated Classes

Students at A.Y. Jackson were asked near the end of their grade 11 or 12 mathematics courses to rate the personal impact of segregated classes in each of the following areas:

- attitude towards math
- achievement in math
- plans to take grade 13 math
- post-secondary educational plans
- future career plans.

Their responses are summarized in Table 1.

A sizeable proportion of students at both grade levels (from 48 to 69 percent) felt that segregated math classes had no effect on their **attitudes toward, or achievement in mathematics.** Statistical analyses showed that for both grade levels students' ratings of the impact of the program on attitudes and achievement depended on the sex of the student.

Males were more likely than females to say that segregated classes had a negative impact on attitudes and achievement. Grade 11 females were more likely than males to view the impact of segregated classes on attitudes and achievement as positive. Grade 12 females were more likely than grade 12 males to believe that segregated classes had no effect on their attitudes or achievement.

Ratings of the impact of the program on **post-secondary educational plans** and **future career plans** did not differ significantly for males and females. The majority of students (64 to 76 percent) believe that the program has had no effect in these areas.

Ratings of the program's impact on **plans to take grade 13 math** did not differ significantly for males and females in grade 11, but did vary according to gender for grade 12 students. Grade 12 females were more likely than their male counterparts to say that the program had a positive effect on their plans to take grade 13 math. However, even for these students by far the majority of both sexes (72 percent) believe the program has had no effect on their plans to take grade 13 math.

In addition to the above rating questions, A.Y. Jackson students were asked to comment. Grade 11 females made positive comments more frequently than the other A.Y. Jackson students. Among the positive comments, students of both sexes most often reported improved concentration and fewer distractions in segregated classes. Females, particularly those in grade 11, also tended to report feeling more comfortable and less intimidated in segregated classes.

TABLE 1

STUDENTS' RATINGS OF THE IMPACT OF SEGREGATED CLASSES

	Sex (N)	Positive Effect %	Negative Effect %	No Effect %	Don't Know/ N/A %	χ^2 (3d.f.)
GRADE 11						
Effect on Attitudes	M (152)	15	22	53	10	24.9***
	F (141)	30	4	57	9	
Effect on Achievement	M (152)	21	22	49	9	18.4***
	F (141)	27	6	48	18	
Effect on plans to take grade 13 math	M (152)	18	3	66	13	1.6
	F (141)	23	4	63	11	
Effect on post-secondary educational plans	M (152)	10	5	64	20	4.51
	F (141)	14	2	69	15	
Effect on future career plans	M (152)	11	5	68	16	3.30
	F (141)	16	2	67	15	
GRADE 12						
Effect on Attitudes	M (144)	17	15	55	13	8.0*
	F (131)	15	6	69	11	
Effect on Achievement	M (144)	18	20	52	10	9.4*
	F (131)	20	8	58	15	
Plans to take grade 13 Math	M (144)	13	6	72	9	10.7*
	F (131)	23	2	72	3	
Post-secondary educational plans	M (144)	10	6	73	12	3.6
	F (131)	8	2	76	15	
Future career plans	M (144)	10	5	72	13	4.3
	F (131)	9	1	75	15	

* $p < .05$
** $p < .01$
*** $p < .001$

Males provided negative comments more frequently than females, tending to feel that segregated classes are less challenging and competitive, and that students do not work as hard. Others have found segregated classes to be less enjoyable, reporting that the atmosphere of regular classes is better. A sizeable proportion of students of both sexes commented that segregated classes have made no difference and have not affected their achievement or future plans. The most frequent comments of A.Y. Jackson Students are summarized in Appendix E.

Experiences in the Segregated Math Program

A. Y. Jackson students were asked to provide an assessment of whether participation in sex-segregated classes had been a positive experience for them. Approximately half of the students indicated that their experience in the program was neutral. However, at both grade levels ratings were significantly dependent upon the sex of the respondent. Females were more likely than males to regard the experience as positive; males were more likely than females to rate the experience as negative. Sex differences in ratings were greater for the grade 11 students. A breakdown of students' responses is provided below.

STUDENTS' RATINGS OF THEIR EXPERIENCES IN SEGREGATED CLASSES

Grade	Sex (N)	Very Positive %	Positive %	Neutral %	Negative %	Very Negative %	N/A %
11	M (152)	7	11	48	20	12	1
	F (141)	23	20	48	6	2	-
	Total	15	15	48	14	7	1
12	M (144)	8	18	48	15	11	-
	F (131)	7	26	52	13	2	-
	Total	8	22	50	14	7	-

Grade 11 χ^2 (4 d.f.) = 36.4, $p < .001$
Grade 12 χ^2 (4 d.f.) = 10.2, $p < .05$

Students were asked to comment on their experiences in segregated classes. Their remarks were generally similar to those made concerning the impact of the program, and are also summarized in Appendix E. Grade 11 females made more positive comments than the remaining students; in contrast, grade 11 males made more negative comments than other students.

Perceptions of A.Y. Jackson and Comparison School Students

Three questions were asked of both students at A.Y. Jackson and the comparison school in order to assess their perceptions of:

- factors affecting students' attitudes toward, and achievement in mathematics
- factors influencing students' decisions to enrol in math throughout high school
- the importance of female math and science teachers for female students.

The factor cited most often by students at both schools as influencing students' attitudes toward, and achievement in math was related to teachers. Within this category specific responses included the quality of teaching, teachers' communication skills and ability to make math interesting, the amount of individual attention provided, and teachers' ability to relate to students. Students at A.Y. Jackson cited factors related to teachers somewhat less frequently than comparison school students (38 to 56 percent versus 51 to 69 percent).

The next most important factor, which was generally cited by similar proportions of students at both schools, was students' willingness to work hard, their motivation, self discipline and/or determination to do well in math. Of the A. Y. Jackson students, however, males cited this factor more often than females (26 to 34 percent for males versus 17 percent for females). Students at both schools also mentioned previous experiences with math about equally often, although females at A.Y. Jackson tended to offer this explanation somewhat more frequently than their male counterparts (21 to 30 for females versus 13 to 16 percent for males).

Most of the remaining factors thought to influence students' attitudes toward and achievement in math tended to be cited by similar proportions of students at the two schools. A summary of responses is provided below.

	A.Y. Jackson				Comparison			
Factors Influencing Attitudes/Achievement	Grade 11		Grade 12		Grade 11		Grade 12	
	M (152) %	F (141) %	M (144) %	F (131) %	M (132) %	F (151) %	M (122) %	F (112) %
. **Teachers**								
- their ability to communicate and make the course interesting								
- the quality of teaching								
- individual attention and degree of involvement in helping students								
- their ability to relate to students	48	56	38	54	61	69	51	62

	A.Y. Jackson				Comparison			
	Grade 11		Grade 12		Grade 11		Grade 12	
	M (152) %	F (141) %	M (144) %	F (131) %	M (132) %	F (151) %	M (122) %	F (112) %
. Students' self discipline and/ or motivation to work								
- students' determination, hard work and/or concentration								
- students' "will to achieve"	26	17	34	17	26	20	27	26
. Students' math marks/achievement								
- previous experiences with math								
- previous success or failure	16	30	13	21	14	20	19	19
. Students' enjoyment of the subject and interest in math								
- students' motivation to learn math	17	13	12	21	21	15	26	20
. Influence of peers (peer pressure)								
- the attitudes of friends toward math								
- whether friends continue in math	18	18	11	15	14	17	16	14
. Parental support and encouragement								
- pressure from family								
- parents' attitudes and understanding of importance of math	13	15	13	21	14	21	22	26
. Positive class atmosphere	19	15	9	8	14	21	11	10
. Future university and/or career plans								
- extent to which math is required or relevant for future plans	14	5	11	9	12	9	27	20

	A.Y. Jackson				Comparison			
	Grade 11		Grade 12		Grade 11		Grade 12	
	M (152) %	F (141) %	M (144) %	F (131) %	M (132) %	F (151) %	M (122) %	F (112) %
. **Students' ability in math** - understanding of math concepts - ability to solve problems easily - understanding the "basics"	10	12	10	5	19	25	28	28
. **Miscellaneous academic factors** - work load/amount of homework - length of periods - lack of time to absorb material due to semestering - quality of textbooks - the school	6	6	6	2	15	11	7	8
. **Opportunity for competition with other students**	3	1	-	1	-	-	-	-
. **Society's attitudes and stereotypes**	-	1	2	2	-	-	-	-
. **Self esteem/self confidence**	1	1	-	2	1	3	-	2
. **No Response**	18	26	20	17	11	9	7	7

Students at both schools listed similar factors as influencing decisions to continue enrolling in math throughout high school. Compared to the previous question, the factors noted differed somewhat in their relative importance. More than half of the students at both schools listed students' math marks or previous success or failure in math as an important influence in their decision to continue taking math. Students' future university or career plans were cited by slightly more than one third of A.Y. Jackson students and by more than half of the students at the comparison school. Students' enjoyment of math was also frequently cited, more so by females at the comparison school than by the other student groups. Comparison school students tended to cite parental support and encouragement more often than did A.Y. Jackson students. Grade 12 comparison school students mentioned students' math ability more often than the remaining students did. A detailed summary of comments is provided below.

Factors Influencing Continued Enrolment in Math	A.Y. Jackson Grade 11 M (152) %	A.Y. Jackson Grade 11 F (141) %	A.Y. Jackson Grade 12 M (144) %	A.Y. Jackson Grade 12 F (131) %	Comparison Grade 11 M (132) %	Comparison Grade 11 F (151) %	Comparison Grade 12 M (122) %	Comparison Grade 12 F (112) %
. Students' math marks/achievement	52	65	51	51	53	64	52	65
. Future university and/or career plans	36	28	37	34	43	58	60	50
. Students' enjoyment or liking of math	18	26	22	19	25	34	25	38
. Teachers' abilities, quality of teaching and their willingness to help students	19	21	16	24	27	30	19	28
. Students' ability in math	14	12	5	11	11	18	21	21
. Parental support and encouragement	9	13	7	13	21	16	20	28
. Influence of peers, whether friends drop math	9	6	6	5	11	5	7	8
. Students' self discipline and/or motivation to succeed	5	2	4	4	10	7	7	11
. Miscellaneous academic factors - work load - course difficulty - school - speed at which course is taught - quality of text books	3	4	1	5	6	4	8	3
. Class atmosphere	5	1	2	1	5	3	4	1
. Self esteem/self confidence	-	-	-	-	2	1	-	-
. No Response	11	13	8	5	8	5	5	2

When asked how important it is for female students to have female teachers for at least some of their math and science courses, slightly more than half of the male and female students at both schools indicated that it is not important at all. Statistical analyses provided no evidence that males and females at either school differed in their opinions. A complete breakdown of students' responses is provided in the following table.

STUDENTS' RATINGS OF IMPORTANCE OF FEMALE MATHEMATICS TEACHERS FOR FEMALE STUDENTS

A.Y. Jackson		Very Important %		Somewhat Important %		Not at all Important %	N/A %
Grade 11	M (152)	3	7	22	7	51	11
	F (141)	5	6	21	12	56	-
	Total	4	6	22	9	53	5
Grade 12	M (144)	6	6	17	13	50	9
	F (131)	8	9	18	13	51	2
	Total	7	7	17	13	51	5
Comparison School							
Grade 11	M (132)	2	5	14	14	58	7
	F (151)	3	3	21	18	55	1
	Total	2	4	17	16	57	4
Grade 12	M (122)	1	5	20	15	58	2
	F (112)	5	8	17	18	51	1
	Total	3	6	18	16	55	2

Students' comments regarding the importance of female math teachers are summarized below. Approximately half of the females at both schools felt that other factors such as teachers' competence and/or understanding are more important. From one quarter to one third of males at both schools offered similar comments. For those who felt that female teachers are important, roughly similar proportions of males and females at both schools commented that it is easier for students to relate to teachers of the same sex.

	A.Y. Jackson				Comparison			
	Grade 11		Grade 12		Grade 11		Grade 12	
	M (152) %	F (141) %	M (144) %	F (131) %	M (132) %	F (151) %	M (122) %	F (112) %
Not at all important								
• **The sex of the teacher makes no difference**								
- "a teacher is a teacher"	15	14	7	9	17	15	23	18

	A.Y. Jackson				Comparison			
	Grade 11		Grade 12		Grade 11		Grade 12	
	M (152) %	F (141) %	M (144) %	F (131) %	M (132) %	F (151) %	M (122) %	F (112) %
• **What matters is not the sex of the teacher but other factors:**								
- quality of teaching/competence								
- how understanding the teacher is	34	52	22	47	23	54	36	41
• **It's up to the student, not the teachers**	1	1	1	1	2	2	3	2
• **Equal rights are more important**								
- "This is the 1980's"	3	1	-	2	-	-	-	-
Somewhat or Very Important								
• **Easier to relate to same-sex teachers**								
- easier to discuss problems								
- students are more relaxed and comfortable								
- beneficial for shy students								
- students more confident/ secure	16	12	10	18	17	8	9	11
• **Female teachers serve as good role models for girls**								
- "inspiration" - examples of success in math								
- girls will want to learn more math	4	7	5	14	10	13	11	13
• **Male teachers may intimidate female students**	-	1	-	-	-	2	-	2
• **It is better for students to have a variety of teachers**	-	-	-	-	2	5	2	4
• **Miscellaneous comments**								
- prefer male teachers because they tend to be better								
- female teachers are more patient								
- male teachers get off topic with females in class	1	1	1	1	-	3	1	-
• **Don't know**	5	1	1	-	-	-	-	-
• **No Response**	22	20	54	18	29	9	16	10

Additional Comments of A.Y. Jackson and Comparison School Students

A.Y. Jackson students were also given the opportunity to make any other comments they felt were appropriate regarding sex-segregated mathematics classes. A relatively small proportion of students took advantage of this opportunity. Those who commented tended to express negative views regarding the segregated math program or the research evaluating it. Students' comments are summarized below.

	Grade 11		Grade 12	
	M (152) %	F (141) %	M (144) %	F (131) %
. **Segregated classes are ineffective, unnecessary and should be ended:**				
- such classes don't prepare students for life				
- segregation is very frustrating				
- the results do not justify the separation				
- performance in math was better before segregation				
- by this age students should be mature enough not to need segregation				
- segregation is unconstitutional and obsolete				
- segregation is stereotyped, sexist and insulting to females				
- segregation hinders females' efforts to be equal to males	12	7	6	11
. **This research and the completion of this survey is a waste of time:**				
- this survey will not help the Board determine whether segregated classes are better				
- there is no point in repeating the survey since my opinions haven't changed in the past 3 years	6	2	5	7
. **Comments regarding teachers:**				
- teachers, not segregated classes, make the difference (e.g. teachers' attitudes to female students; how good the teachers are)	1	4	3	2
- having a good teacher this year has made a big difference	-	3	-	-
- other comments re teachers	1	1	-	-
. **Segregated classes make little difference:**				
- such classes have advantages and disadvantages				
- attitudes and achievement depend mainly on the student's self confidence and willingness to learn	1	4	1	4
. **Segregated classes are beneficial and should be continued:**				
- science should be segregated				
- a survey should be done in science	-	5	1	1

	Grade 11 M (152) %	Grade 11 F (141) %	Grade 12 M (144) %	Grade 12 F (131) %
• **Comments regarding math:**				
- the math we are taught is useless; math is presented as mechanical; math is irrelevant and boring; math should be made more interesting	1	2	-	1
- it is important to take grade 13 math	-	1	1	-
• **The sex of the teacher makes little difference:**				
- some male teachers can be good role models for female students	1	3	-	-
• **Students work harder and are more competitive when both sexes are present**	2	-	1	-
• **Segregated classes may be beneficial for girls who are intimidated by boys or for students who are poor in math:**				
- segregation should be voluntary	-	-	-	3
• **No response**	75	72	83	75

Students at the comparison school were also given an opportunity to make additional comments. Although the majority did not comment, many of those who did expressed concerns related to teachers, or questioned either the value of the research or the justification for having sex-segregated classes. Their comments are summarized below:

	Grade 11 M (132) %	Grade 11 F (151) %	Grade 12 M (122) %	Grade 12 F (112) %
• **Comments regarding teachers:**				
- some teachers have poor attitudes or don't provide enough encouragement or individual help				
- teachers should be evaluated regularly; tenure should be ended				
- having too many teachers in one semester makes it very difficult	6	6	4	11
• **The research survey is sexist and/or a waste of time**	7	1	6	5
• **Sex-segregated classes are sexist, out-of-date or unjustified**	2	3	2	6
• **Comments re math:**				
- math courses should be more practically oriented				
- math should be made more interesting				
- math should not be semestered	2	1	1	1
• **No Response**	86	85	86	76

Career Aspirations of Students

Grade 11 and 12 students at both A.Y. Jackson and the comparison school were asked to indicate what career they expect to have. Students who were unsure about future careers were asked to indicate what career appeals to them the most at the moment or seems like a possibility. For the purposes of analysis, the careers were grouped according to the amount of mathematics required or recommended.

Students' responses in Year III are presented in Table 2 (page 26). Compared to females, males at both schools and in both grades were more likely to aspire to careers for which grade 13 mathematics is required or recommended (81-89% of males versus 68-78% of females).

Table 3 summarizes for all three years of the study the percentage of students selecting careers for which grade 13 math is required or recommended (page 27). As students progress through the grades, an increasing proportion of them select careers with greater math requirements. At both schools the percentage increase is typically larger for males than females. Based on students' career choices, there is little evidence that the sex-segregated mathematics program encouraged females at A.Y. Jackson to focus their future plans on occupations which require higher levels of mathematics. Their level of aspirations were similar to those of females at the comparison school, and were considerably lower in terms of math requirements than those of male students at both schools.

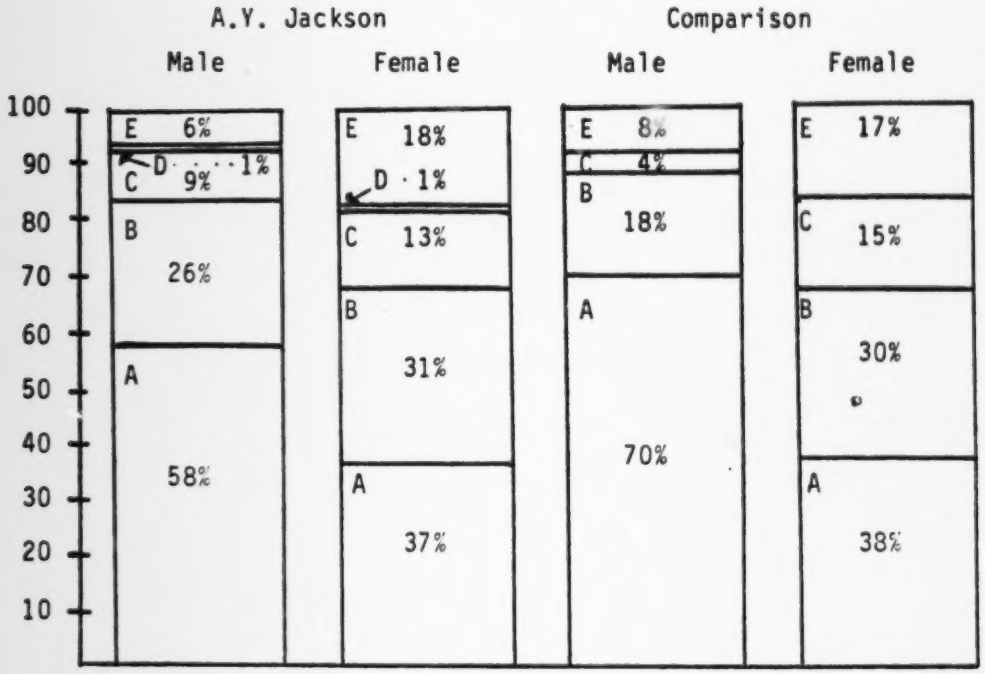
Students at both schools were asked to rate the extent to which their math teachers provided information related to career choices requiring math. Statistical analyses indicated that male and female perceptions did not differ significantly at either A.Y. Jackson or the comparison school. Furthermore, the perceptions of students at the two schools did not differ significantly. Nearly half of the students reported that their teachers provide little of no information about career choices requiring math.

STUDENTS' RATINGS OF THE AMOUNT OF CAREER INFORMATION PROVIDED BY MATHEMATICS TEACHERS

A.Y. Jackson		A Lot %		Some %		Little or None %	N/A %
Grade 11	M (152)	9	11	17	13	47	2
	F (141)	11	11	21	10	45	2
Grade 12	M (144)	8	9	16	14	49	3
	F (131)	10	12	22	13	40	4
Comparison School							
Grade 11	M (132)	7	9	23	14	38	9
	F (151)	7	6	18	14	46	10
Grade 12	M (122)	9	10	24	12	37	8
	F (112)	8	9	25	14	39	5

Students' Career Aspirations Related to The Amount of Math Required

Grade 11



A. Gr. 13 required
B. Gr. 13 recommended
C. Gr. 12 required
D. Gr. 12 recommended
E. Gr. 11 or less

Grade 12

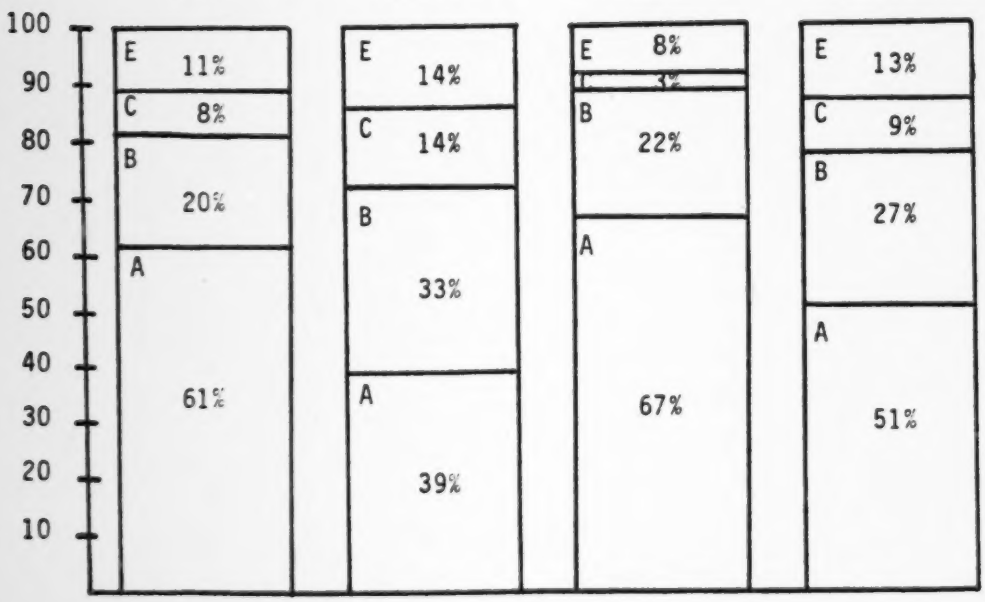


TABLE 3

Percentage of students aspiring to careers for which grade 13 math is required or recommended

	Males					Females				
	Gr. 10 Pre	Gr. 10 Post	Gr. 11	Gr. 12	% Change	Gr. 10 Pre	Gr. 10 Post	Gr. 11	Gr. 12	% Change
Cohort I										
A. J. Jackson	66	69	64	81	+15	65	64	66	72	+ 7
Comparison	73	71	74	89	+16	62	56	64	78	+16
Cohort II										
A. J. Jackson	N/A	62	84	N/A	+22	N/A	57	68	N/A	+11
Comparison	N/A	79	88	N/A	+ 9	N/A	66	68	N/A	+ 2

Ratings were then made by students at both schools of the extent to which the career information provided by math teachers has affected their future educational and career plans. The following table provides a summary of students' responses. For grade 12 students at A.Y. Jackson, females were significantly more likely than males to indicate that such career information had some influence over their future plans; no gender difference was found for grade 11 A.Y. Jackson students. There was no significant difference between grade 12 females in the two schools, although grade 12 males at A.Y. Jackson were less likely than their comparison school peers to say that such information had influenced them. At the grade 11 level, both males and females at A.Y. Jackson were more likely than students at the comparison school to say that information provided by their teachers had affected their future plans.

EXTENT TO WHICH CAREER INFORMATION FROM MATHEMATICS TEACHERS AFFECTED FUTURE PLANS

		Some Influence	Little or Influence	N/A
A.Y. Jackson				
Grade 11	M (152)	35	40	26
	F (141)	32	35	23
Grade 12	M (144)	29	37	33
	F (131)	39	39	22
Comparison School				
Grade 11	M (132)	26	53	20
	F (151)	18	41	42
Grade 12	M (122)	34	46	20
	F (112)	38	41	21

Post-Secondary Educational Plans

Students at both schools were asked whether they planned to pursue post-secondary education. Eighty-four percent of the grade 11 and 90 percent of the grade 12 students at A.Y. Jackson said that they planned to do so; females and males responded similarly. A somewhat larger proportion of comparison school students (from 86 to 96 percent) indicated that they would continue their education after high school. Students at A.Y. Jackson were slightly more likely than those at the comparison school to say their plans were uncertain (from 6 to 14 percent of A.Y. Jackson students, compared to 4 to 9 percent of comparison school students).

Ratings were subsequently made by students at both schools of the extent to which grade 13 math is necessary to their post-secondary educational plans. In general, slightly less than two thirds of students indicated that grade 13 math was required. Statistical analyses provided no evidence that the opinions of males and females at A.Y. Jackson differed significantly. Additional analyses failed to find any significant difference between schools.

IV. STUDENT PARTICIPATION RATES IN MATHEMATICS

In order to assess the effect of segregated classes on student participation rates in mathematics, data were gathered regarding the 1986/87(Year III) enrolment at all levels at both A.Y. Jackson and the comparison school. This information is summarized below. Comparable information collected in 1984/85 (Year I) and 1985/96 (Year II) is also provided.

Male/Female Composition of Mathematics Courses

		A.Y. Jackson						Comparison School					
		Male %			Female %			Male %			Female %		
General Level[1]	Year	I	II	III	I	II	III	I	II	III	I	II	III
Grade 10		40	48	61	60	52	39	50	38	58	50	62	42
Grade 11		43	44	49	57	56	51	22	58	42	78	42	58
Grade 12		45	40	51	55	60	49	48	46	36	52	54	64
Total		44	44	53	56	56	47	40	45	44	60	55	56
Advanced/Enriched Levels													
Grade 10		52	53	54	48	47	46	53	48	49	47	52	51
Grade 11		52	53	50	48	47	50	54	54	49	46	46	51
Grade 11	Computer Science[2]	65	77	76	35	23	24	61	65	NA	39	35	NA
Grade 12		52	53	53	48	47	47	54	55	54	46	45	46
Grade 12	Computer Science	81	78	84	19	22	16	92	81	NA	8	19	NA
Grade 13	Algebra	81	61	52	19	39	48	75	65	64	25	35	36
Grade 13	Calculus	58	49	60	42	51	40	59	58	58	41	42	42
Grade 13	Functions/Relations	55	54	56	45	46	44	55	58	56	45	42	44
Grade 13	Investment	57	65	62	43	35	38		N.A.			N.A.	
Total		56	55	56	44	45	44	55	55	53	45	45	47
TOTAL		54	54	56	46	46	44	56	55	53	44	45	47

1. There have been some large changes in the proportion of males and females enrolled in general level math courses. However, due to the relatively small number of students in general level math at both schools, these shifts may represent chance fluctuation.

2. The proportion of female students enrolled in computer science courses is very low at both schools. The segregated math program has apparently not encouraged females at A.Y. Jackson to select this math and science-oriented field as an area of study.

For grades 10, 11 and 12 advanced and enriched level mathematics, as well as grade 13 functions/relations, there have been minimal changes over time in the proportions of males and females enrolled at both A.Y. Jackson and the comparison school. Furthermore, the proportions of males and females enrolled in these courses are still quite similar at the two schools.

A substantial increase in the proportion of females enrolled in algebra at A.Y. Jackson was noted. The change in proportion from 19 percent female in Year I to 48 percent female in Year III was statistically significant. Although the proportion of females enrolled in algebra rose 10 percent between Years I and II at the comparison school, there was no further increase in female enrolment in Year III. Overall, this change was not statistically significant.

By the second year of the study, there was an increase (of borderline statistical significance) in the proportion of females enrolled in calculus at A.Y. Jackson. Although the fluctuations in the proportions of males and females enrolled in calculus from Years I to III were statistically significant, there was no evidence of sustained increase in calculus enrolment for females. By the end of the study, the proportion of females enrolled in calculus at A.Y. Jackson had dropped back down to a level slightly below the proportion found in Year I. The proportion of females taking calculus at the two schools was comparable in Year III (about 41 percent). Female enrolment in calculus remained stable at the comparison school throughout the study.

Students at A.Y. Jackson and the comparison school were asked if they planned to take additional mathematic courses during the following year. The majority of students (88-98%) intend to continue enrolling in mathematics.

Based on statistical analyses comparing the responses of males and females, no significant gender differences in plans to take math were found at either school. Of the school comparisons, only one was statistically significant. Grade 12 males at the comparison school were more likely than their counterparts at A.Y. Jackson to say that they planned to take math next year (98 versus 89 percent respectively).

Additional information about specific grade 13 course selections was requested. As can be seen from the following table, roughly similar proportions of the male and female students at A. Y. Jackson intend to take each of the four grade 13 math courses offered at the school. Students of both sexes intend to enrol in an average of 1.9 math courses.

PLANNED ENROLMENT IN SPECIFIC GRADE 13 MATHEMATICS COURSES

	A.Y. Jackson		Comparison	
	Male %	Female %	Male %	Female %
Algebra	23	26	25	17
Calculus	63	58	84	66
Functions/Relations	83	89	97	88
Investment	21	18	N.A.	N.A.
No plans to take Math	2	5	2	6
No answer	6	3		4
Average number of Math courses per student	1.9	1.9	2.1	1.7

A larger proportion of males than females at the comparison school intend to take algebra, calculus and functions/relations. Comparison school males intend to take an average of 2.1 math courses, slightly more than A.Y. Jackson students. However, comparison school females intend to enrol in fewer math courses than either their male peers or A. J. Jackson students, averaging 1.7 courses per student.

SUMMARY

The program of sex-segregated mathematics classes at A. Y. Jackson Secondary School began in 1984-85 with grade 10 advanced classes. In the two subsequent years, grade 11 and grade 12 advanced mathematics classes were also segregated by sex. In order to evaluate the impact of the program on students' attitudes toward, and achievement in mathematics, enrolment in mathematics classes, and future plans, data were gathered from A. Y. Jackson students and a sample of students at a comparison school.

These student samples were subdivided into two cohorts for the purposes of analysis. The first cohort was comprised of students who were in grade 10 sex-segregated classes in 1984-85, grade 11 in 1985-86, and grade 12 in 1986-87. The second cohort consisted of students who were in grade 10 advanced math in 1985-86 and grade 11 in 1986-87.

The **longitudinal analyses comparing the attitudes of Cohort I** students in grades 10, 11 and 12 provided very little evidence that segregated classes have had a beneficial effect on female students' attitudes toward mathematics.

Females at the comparison school appeared to be somewhat more anxious about math, less confident in their ability to learn math, and to feel that their teachers had less positive attitudes towards them as learners of math than females at A. Y. Jackson, particularly by the end of grade 12. However, such trends do <u>not</u> provide clear cut evidence that the segregated math program was of benefit to females at A. Y. Jackson since the differences were not statistically significant.

The degree of enjoyment and challenge in math and perceptions of the usefulness of math declined over time to a significantly greater degree for A. Y. Jackson students (of both sexes) than for students at the comparison school. However, it should be noted that at the end of grade 10 (the end of the first year in sex-segregated classes) A. Y. Jackson students regarded math as more useful and reported greater enjoyment and challenge than did comparison school students. By the end of grade 12, students at both schools expressed fairly similar attitudes on both the usefulness and effectance scales. Thus, for these two scales there was no evidence that the program produced a lasting beneficial impact on attitudes for A. Y. Jackson students.

During the three years of the study, A. Y. Jackson students became somewhat more likely to anticipate positive consequences as a result of success in mathematics. The attitudes of comparison school students showed little change or became slightly more negative. The difference in trends over time at the two schools was of borderline statistical significance, providing evidence of a slight benefit of the segregated math program on this attitude scale.

Comparison of **Cohort II** students at the two schools provided no evidence that sex-segregated mathematics classes led to more positive attitudes among these A. Y. Jackson students. Contrary to expectations, A. Y. Jackson students of both sexes were significantly more anxious about math and less confident in their abilities as learners of mathematics than comparison school students.

Although some significant sex differences and changes over time were found for Cohort II, these tended to be similar for students at the two schools.

The pattern of changes in **final math marks** differed for the two cohorts of students. For **Cohort I**, females received significantly higher marks than males at all grades and at both schools. The fluctuations and overall declines in marks that occurred between grades 9 and 12 were significantly greater for both sexes at the comparison school than at A. Y. Jackson. By the end of grade 12, females at A. Y. Jackson received somewhat higher marks than the remaining groups of students although this trend was not significant statistically.

For **Cohort II** students, no significant differences in the marks of males and females were found at either school. However, between grades 9 and 11, the marks of both males and females at A. Y. Jackson declined significantly more than the marks of comparison school students. On average, A. Y. Jackson students received significantly lower marks than their comparison school peers.

A variety of explanations could be offered for the differences in the pattern of attitude and achievement results for the two cohorts of students. Due to sampling fluctuation, students in the two cohorts may have differed on a number of dimensions prior to the study. Another possibility is that the experiences of the two cohorts of A. Y. Jackson students in the program may have been substantially different due to such factors as the following:

- the novelty of the program and the considerable media attention focusing on it in Year I
- the considerable controversy about the rationale and objectives of the program among students of both sexes
- significant personnel changes at A. Y. Jackson in Year III which resulted in the loss of all but one of the female mathematics teachers - Cohort II female students thus had only one year in the program with female mathematics teachers.

Information was gathered regarding changes in the **proportion of males and females enrolled in advanced and general mathematics courses** at the two schools. Of greatest interest was the enrolment of females in grade 13 mathematics, where the greatest under-representation of females has been found in the past. For grades 10, 11 and 12 advanced and enriched level mathematics, as well as grade 13 functions/relations, there were minimal changes over time in the proportions of males and females enrolled at both A Y. Jackson and the comparison school. Furthermore, the proportion of males and females enrolled in these courses was quite similar at the two schools.

A substantial increase in the proportion of females enrolled in algebra at A. Y. Jackson was noted. The change in proportion from 19 percent female in Year I to 48 percent female in Year III was statistically significant. Although the proportion of females enrolled in algebra rose 10 percent between Years I and II at the comparison school, there was no further increase in female enrolment in Year III; this change was not statistically significant.

By the second year of the study, there was an increase (of borderline statistical significance) in the proportion of females enrolled in calculus at A. Y. Jackson. By the end of the study, however, the proportion of females enrolled in calculus at A. Y. Jackson had dropped back down to a level slightly below the proportion found in Year I. Thus, there was no evidence of sustained increase in calculus enrolment for females. The proportion of females taking calculus at the two schools was comparable in Year III (about 41 percent). Female enrolment in calculus remained stable at the comparison school throughout the study.

The majority of students (88 - 98%) at both schools intended to continue enrolling in mathematics. No significant gender differences in plans to take math were found at either school. Both females and males at A. Y. Jackson indicated that they intend to take an average of 1.9 grade 13 math courses.

A. Y. Jackson students were asked a number of questions regarding the **personal impact of sex-segregated classes.** Ratings of the impact of the program on plans to take grade 13 math, and on future educational and career plans generally did not differ for males and females. Although a sizeable proportion of all A. Y. Jackson students (from 48 to 69 percent) felt that the program had no effect on their attitudes toward, or achievement in mathematics, some significant gender differences were found. Males were more likely than females to believe that segregated classes had a negative effect on attitudes and achievement. Depending on grade level, females were more likely than males to believe that the program had a positive influence (grade 11) or no influence (grade 12) on their attitudes and achievement.

Among the positive comments, students of both sexes most often reported improved concentration and fewer distractions in sex-segregated classes. Females, particularly those in grade 11, also tended to report feeling more comfortable and less intimidated in segregated classes.

Males provided negative comments more frequently than females, tending to feel that segregated classes are less challenging and competitive, and that students do not work as hard. Others found segregated classes to be less enjoyable, reporting that the atmosphere of regular classes is better. A sizeable proportion of students of both sexes commented that the program made no difference to their attitudes, achievement or future plans.

Students at both schools were asked to describe factors affecting students' attitudes toward and achievement in mathematics. The factor cited most often by students at both schools related to teachers, and included the quality of teaching, teachers' communication skills and ability to make math interesting, and the amount of individual attention provided. The next most important factor, which was generally cited by similar proportions of students at both schools, was students willingness to work hard, motivation, self discipline and determination to do well in math.

Students at both schools listed similar factors as influencing decisions to continue enrolling in math throughout high school. More than half of the students at both schools listed students' math marks or previous success or failure in math as important influences on their decisions to continue taking mathematics.

APPENDIX A

QUESTIONNAIRE

A.Y. JACKSON SECONDARY SCHOOL

Student Questionnaire
1986-87

Your answers will be kept **strictly confidential** and will not be reported to your teacher. We in the research department do ask that you put your name on the questionnaire. This is the only way we can match up all the information which is necessary to interpret the results of the survey.

Name: _____

A. SEX: Male ☐ Female ☐

B. Please read each of the following statements carefully and indicate the extent to which you agree or disagree with each statement.

	Strongly Agree 1	2	3	4	5	Strongly Disagree 6
1. Being regarded as smart in mathematics would be a great thing.	☐	☐	☐	☐	☐	☐
2. Studying mathematics is just as appropriate for women as for men.	☐	☐	☐	☐	☐	☐
3. I get a sinking feeling when I think of trying hard math problems.	☐	☐	☐	☐	☐	☐
4. My mother wouldn't encourage me to plan a career which involves math.	☐	☐	☐	☐	☐	☐
5. I'm no good in math.	☐	☐	☐	☐	☐	☐
6. My teachers have encouraged me to study more mathematics.	☐	☐	☐	☐	☐	☐
7. I expect to have little use for mathematics when I get out of school.	☐	☐	☐	☐	☐	☐
8. I don't understand how some people can spend so much time on math and seem to enjoy it.	☐	☐	☐	☐	☐	☐
9. My father thinks that mathematics is one of the most important subjects I have studied.	☐	☐	☐	☐	☐	☐

		Strongly Agree 1	2	3	4	5	Strongly Disagree 6
10.	It would make me happy to be recognized as an excellent student in mathematics.	☐	☐	☐	☐	☐	☐
11.	Males are not naturally better than females in mathematics.	☐	☐	☐	☐	☐	☐
12.	I usually have been at ease during math tests.	☐	☐	☐	☐	☐	☐
13.	My mother has shown no interest in whether or not I take more math courses.	☐	☐	☐	☐	☐	☐
14.	I can get good grades in mathematics.	☐	☐	☐	☐	☐	☐
15.	Getting a mathematics teacher to take me seriously has usually been a problem.	☐	☐	☐	☐	☐	☐
16.	Mathematics is of no relevance to my life.	☐	☐	☐	☐	☐	☐
17.	I am challenged by math problems I can't understand immediately.	☐	☐	☐	☐	☐	☐
18.	My father has strongly encouraged me to do well in mathematics.	☐	☐	☐	☐	☐	☐
19.	I'd be happy to get top grades in mathematics.	☐	☐	☐	☐	☐	☐
20.	I would have more faith in the answer for a math problem solved by a man than a woman.	☐	☐	☐	☐	☐	☐
21.	Mathematics usually makes me feel uncomfortable and nervous.	☐	☐	☐	☐	☐	☐
22.	My mother thinks that mathematics is one of the most important subjects I have studied.	☐	☐	☐	☐	☐	☐
23.	I'm not the type to do well in math.	☐	☐	☐	☐	☐	☐
24.	Math teachers would think I wasn't serious if I told them I was interested in a career in science and mathematics.	☐	☐	☐	☐	☐	☐
25.	Mathematics will not be important to me in my life's work.	☐	☐	☐	☐	☐	☐
26.	Mathematics is enjoyable and stimulating to me.	☐	☐	☐	☐	☐	☐

	Strongly Agree 1	2	3	4	5	Strongly Disagree 6
27. My father wouldn't encourage me to plan a career which involves math.	☐	☐	☐	☐	☐	☐
28. It would be really great to win a prize in mathematics.	☐	☐	☐	☐	☐	☐
29. I would trust a woman just as much as I would trust a man to figure out important calculations.	☐	☐	☐	☐	☐	☐
30. My mind goes blank and I am unable to think clearly when working mathematics.	☐	☐	☐	☐	☐	☐
31. My mother has strongly encouraged me to do well in mathematics.	☐	☐	☐	☐	☐	☐
32. Generally, I have felt secure about attempting mathematics.	☐	☐	☐	☐	☐	☐
33. My math teachers have been interested in my progress in mathematics.	☐	☐	☐	☐	☐	☐
34. Mathematics is a worthwhile and necessary subject.	☐	☐	☐	☐	☐	☐
35. Figuring out mathematical problems does not appeal to me.	☐	☐	☐	☐	☐	☐
36. My father has shown no interest in whether or not I take more math courses.	☐	☐	☐	☐	☐	☐
37. I don't like people to think I'm smart in math.	☐	☐	☐	☐	☐	☐
38. Girls can do just as well as boys in mathematics.	☐	☐	☐	☐	☐	☐
39. I usually have been at ease in math classes.	☐	☐	☐	☐	☐	☐
40. For some reason even though I study, math seems unusually hard for me.	☐	☐	☐	☐	☐	☐
41. My teachers think I'm the kind of person who could do well in mathematics.	☐	☐	☐	☐	☐	☐
42. Knowing mathematics will help me earn a living.	☐	☐	☐	☐	☐	☐

		Strongly Agree 1	2	3	4	5	Strongly Disagree 6
43.	I do as little work in math as possible.	☐	☐	☐	☐	☐	☐
44.	People would think I was some kind of a browner if I got A's in math.	☐	☐	☐	☐	☐	☐
45.	I would expect a woman mathematician to be a masculine type of person.	☐	☐	☐	☐	☐	☐
46.	I haven't usually worried about being able to solve math problems.	☐	☐	☐	☐	☐	☐
47.	I am sure that I can learn mathematics.	☐	☐	☐	☐	☐	☐
48.	It would make people like me less if I were a really good math student.	☐	☐	☐	☐	☐	☐
49.	Girls who enjoy studying math are a bit peculiar.	☐	☐	☐	☐	☐	☐
50.	If I had good grades in math, I would try to hide it.	☐	☐	☐	☐	☐	☐
51.	It's hard to believe a female could be a genius in mathematics.	☐	☐	☐	☐	☐	☐

This part of the questionnaire gives you an opportunity to comment on your current and past experiences in the sex-segregated mathematics program. Your opinions will be an important part of the evaluation of this program. Your answers will be completely confidential. The specific answers of individual students will not be identified by name.

1. Has your involvement in the segregated math program affected the following:

	Yes		No	Don't
	Positive Effect	Negative Effect	Effect	Know
a) your attitudes toward math	☐	☐	☐	☐
b) your achievement in math	☐	☐	☐	☐
c) your plans to take grade 13 math	☐	☐	☐	☐
d) your post-secondary educational plans	☐	☐	☐	☐
e) your future career plans	☐	☐	☐	☐

Please explain. _____

_____

_____

_____

2.a) How would you describe your experience in the sex-segregated math program this year?

Very Positive	Somewhat Positive	Neutral	Somewhat Negative	Very Negative
☐	☐	☐	☐	☐

Please explain. _____

_____

b) Have your experiences in the segregated math program this year differed from your experiences in the program last year?

Yes ☐ No ☐ Not Applicable (not in program last year) ☐

If yes, please describe. _____

_____

_____

3. What factors do you think affect students' attitudes toward and achievement in math? (Please list.)

_____

_____

_____

_____

4. What factors do you think affect whether students continue to take math throughout high school?

_____

_____

_____

_____

5. How important is it for female students to have female teachers for at least some of their math and science courses?

Very Important		Somewhat Important		Not At All Important
☐	☐	☐	☐	☐

Please explain. _____

_____

_____

6. For your grade 10, 11 and 12 math courses, did you have male or female math teachers?

	Male	Female
Grade 10	☐	☐
Grade 11	☐	☐
Grade 12	☐	☐

7. To what extent have your grade 10, 11 and 12 math teachers provided you with information related to career choices that require math?

	Provided **A Lot Of** Information		Provided **Some** Information		Provided **Little or no** Information
Grade 10 teacher	☐	☐	☐	☐	☐
Grade 11 teacher	☐	☐	☐	☐	☐
Grade 12 teacher	☐	☐	☐	☐	☐

If your math teachers have given you career information, to what extent has this information affected your future educational and career plans?

Very Much So ☐ ☐ Somewhat ☐ ☐ Not At All ☐

Please explain. _____

_____

_____

8. What career do you expect to have (if you are unsure, please indicate the career which appeals to you the most right now or seems like a possibility)?

_____

9. Do you intend to pursue post-secondary education?

Yes ☐ No ☐ Don't Know ☐

10. How necessary is grade 13 math to your post-secondary educational and career plans?

Not At All Necessary ☐ ☐ Helpful But Not Required ☐ ☐ Required ☐

11. FOR GRADE **10** MATH STUDENTS ONLY: Are you planning to take grade 11 math?

	Yes	No	Don't Know
Next semester	☐	☐	☐
Next year (1987-88)	☐	☐	☐

If no, please explain. _____

_____

_____

12. FOR GRADE **11** MATH STUDENTS ONLY: Are you planning to take grade 12 math?

	Yes	No	Don't Know
Next semester	☐	☐	☐
Next year (1987-88)	☐	☐	☐

If no, please explain. _____

_____

_____

13. FOR GRADE **12** MATH STUDENTS ONLY: Are you planning to take any grade 13 math courses?

	Yes	No	Don't Know
Next semester	☐	☐	☐
Next year (1987-88)	☐	☐	☐

If yes, which grade 13 math courses do you plan to take? (Check all that apply.)

Algebra	☐	Functions & Relations	☐
Calculus	☐	Mathematics of Investment	☐

If no, please explain. _____

_____

_____

Additional Comments.

THANK YOU FOR YOUR CO-OPERATION

ERES
Nov/86

APPENDIX B

Longitudinal Analyses of
Mathematics Attitudes Scales

COHORT I

COHORT I

Longitudinal Analyses of Math Attitudes

Univariate F Ratios

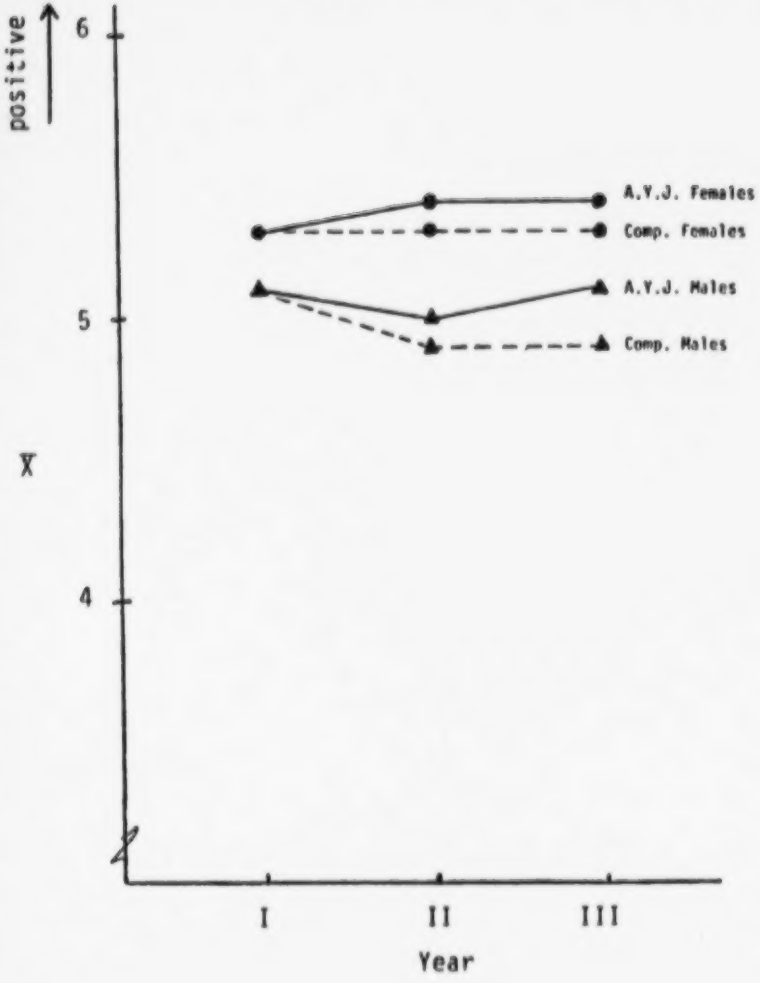
BETWEEN SUBJECTS	SEX	SCHOOL	SEX x SCHOOL
Success in math	15.26 ***	.92	.05
Male domain	41.09 ***	.03	.37
Anxiety	.00	1.79	2.41
Mother	.98	.95	.12
Confidence	1.18	1.29	1.06
Teacher	1.04	.33	1.75
Usefulness	.00	.09	.03
Effectance	1.85	.10	.27
Father	.24	.38	.15

WITHIN SUBJECTS	TIME	SEX x TIME	SCHOOL x TIME	SEX x SCHOOL x TIME
Success in math	.88	1.79	2.48 1	.25
Male Domain	.95	6.35 **	.52	1.21
Anxiety	1.77	.17	1.24	.20
Mother	1.39	.01	.12	.10
Confidence	8.07 ***	.34	.60	1.18
Teacher	7.71 ***	.84	.65	.64
Usefulness	13.31 ***	.78	4.58 **	.33
Effectance	1.49	.50	3.46 *	.06
Father	2.54 2	1.44	.99	.18

* $p < .05$
** $p < .01$
*** $p < .001$
1 $p = .085$
2 $p = .08$

COHORT I

'ttitudes Towards Success in Mathematics



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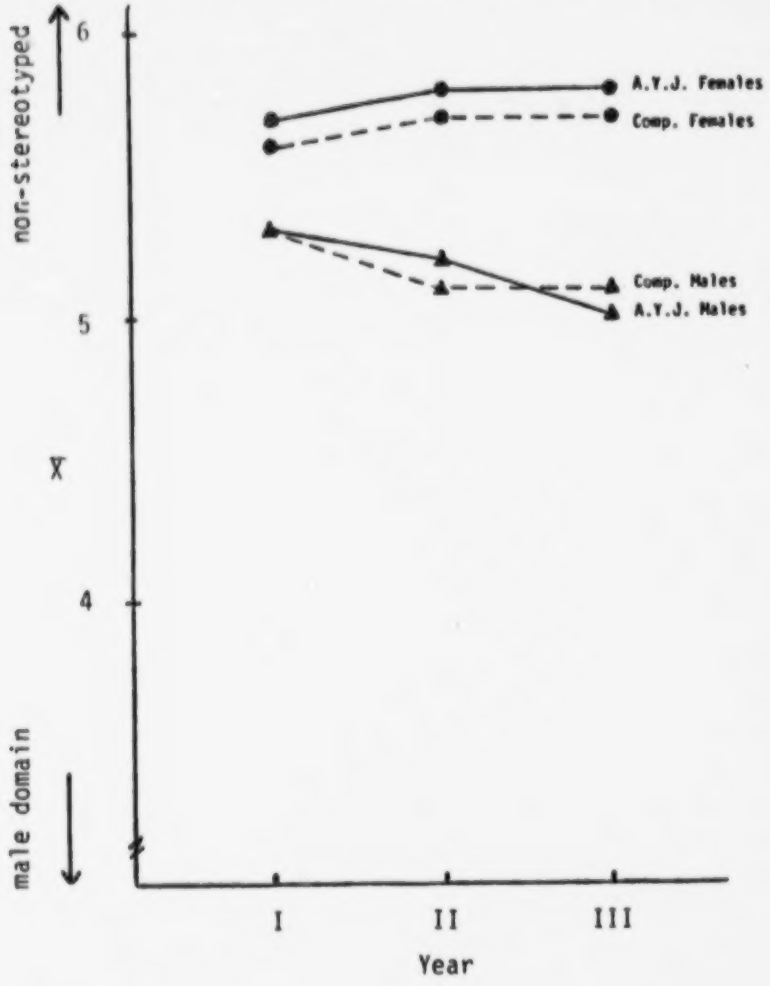
Mathematics as a Male Domain



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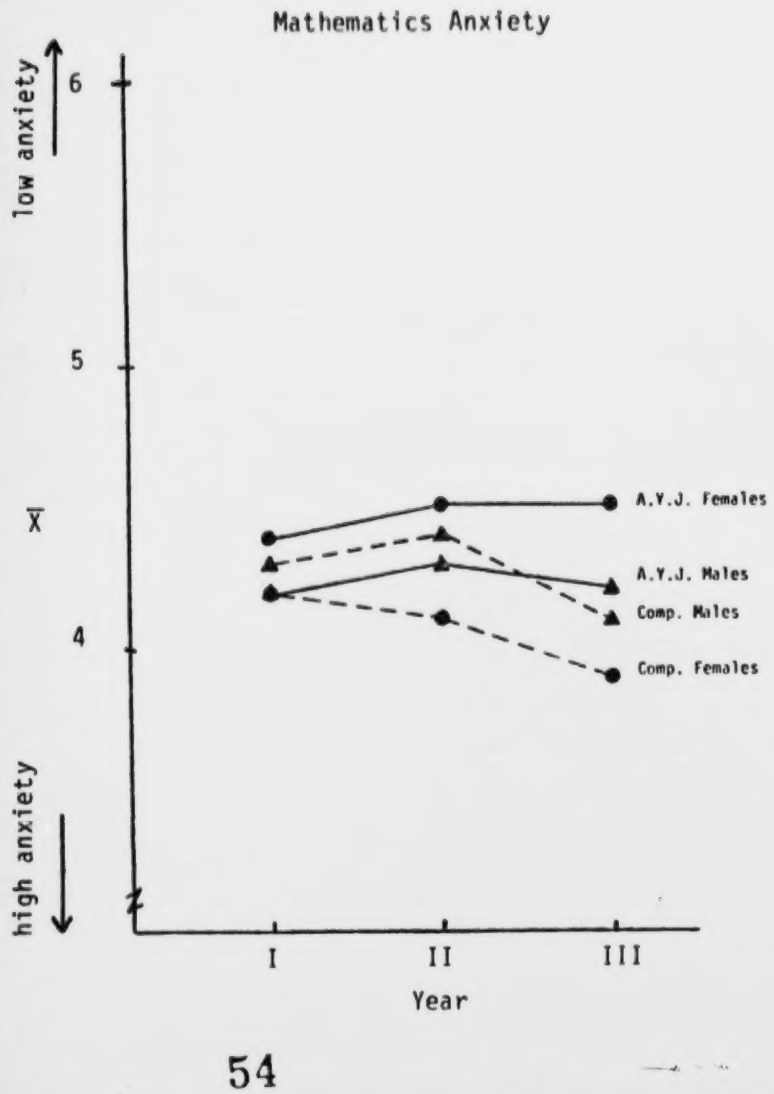
COHORT I



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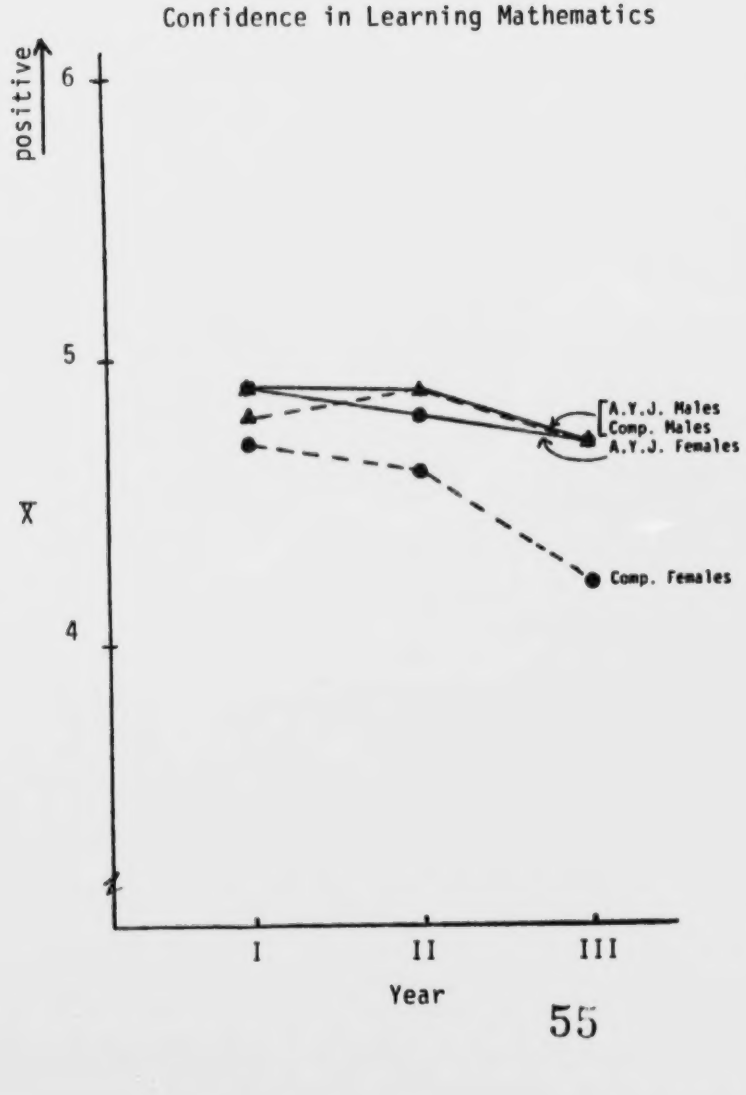

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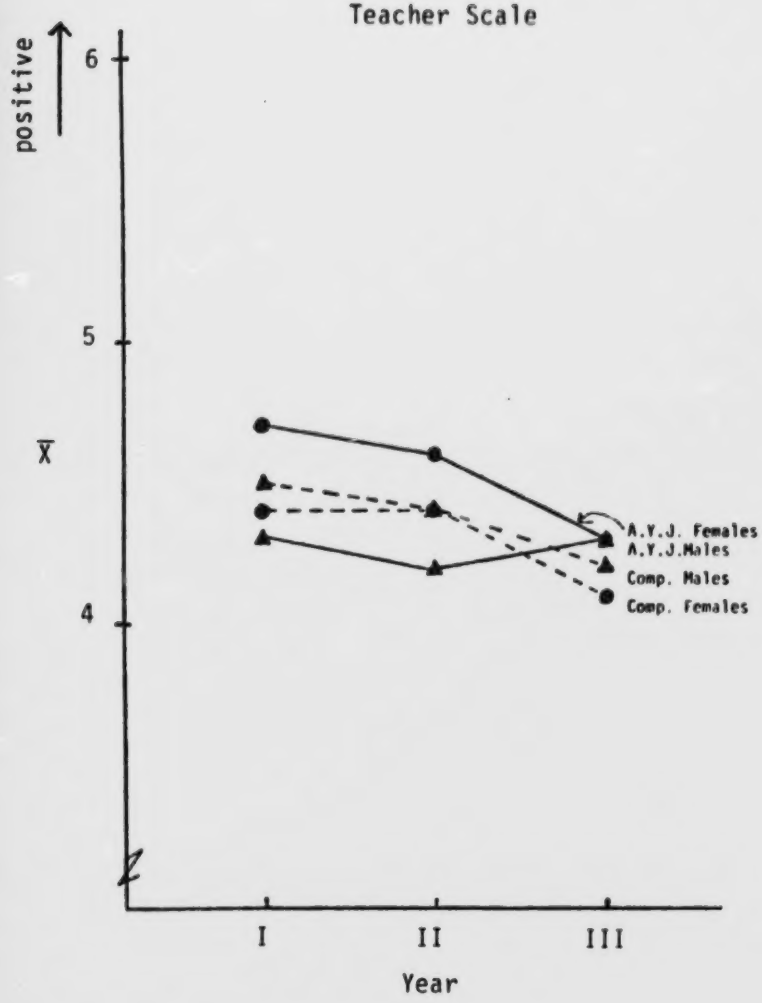
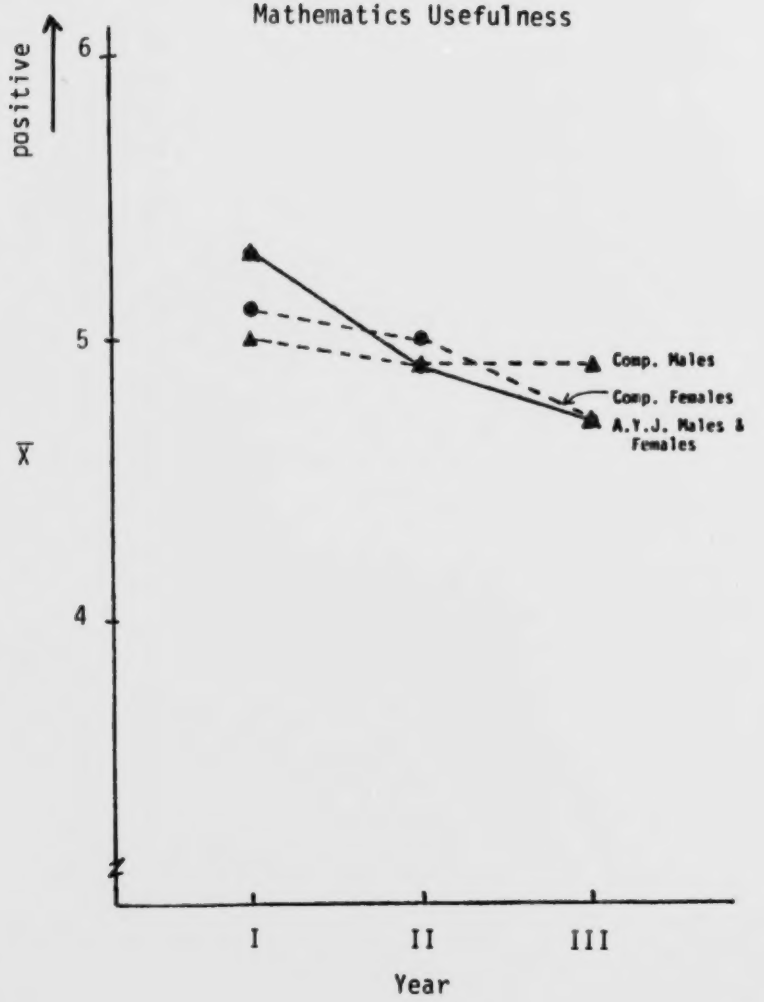
COHORT I

Teacher Scale



56

Mathematics Usefulness



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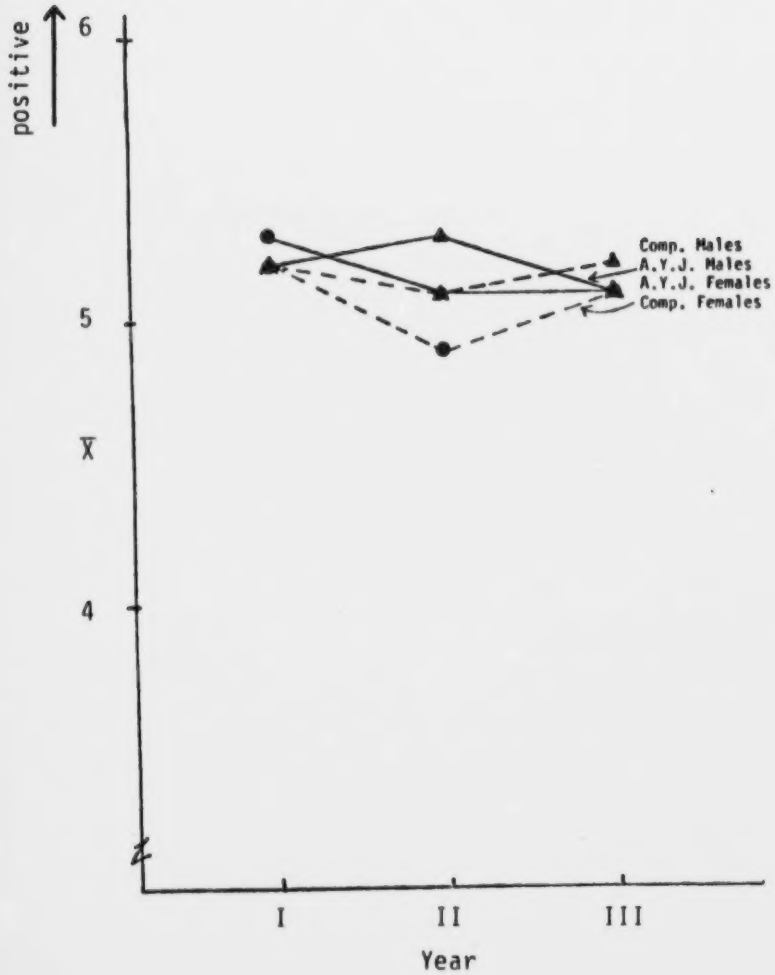
COHORT I

Father Scale



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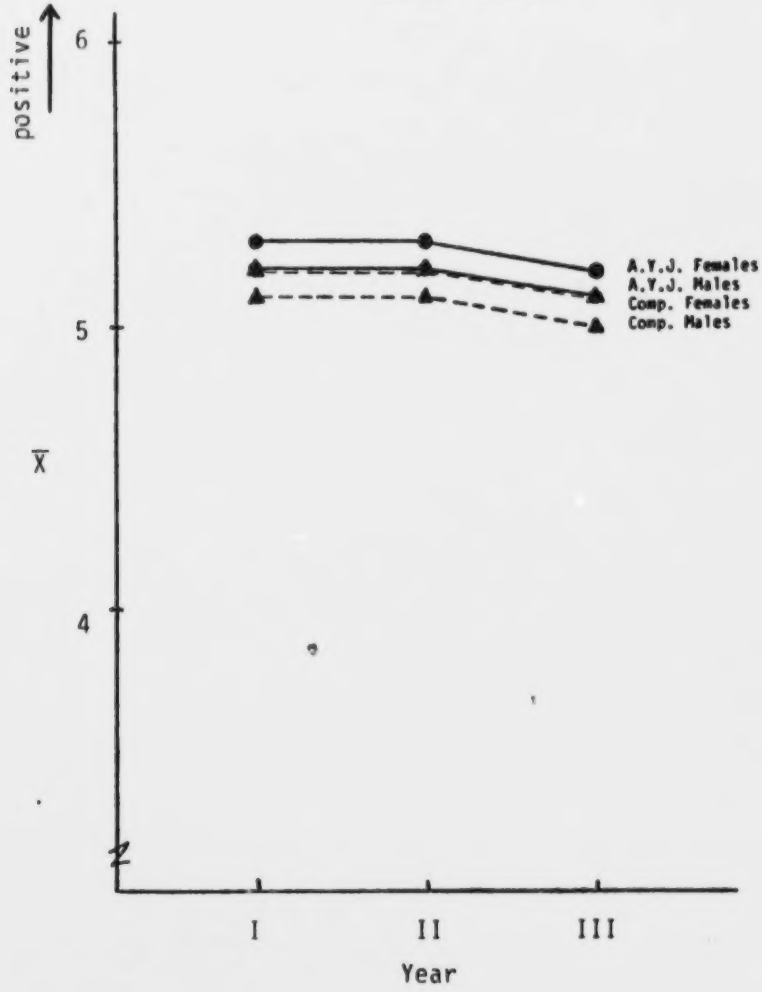
Mother Scale



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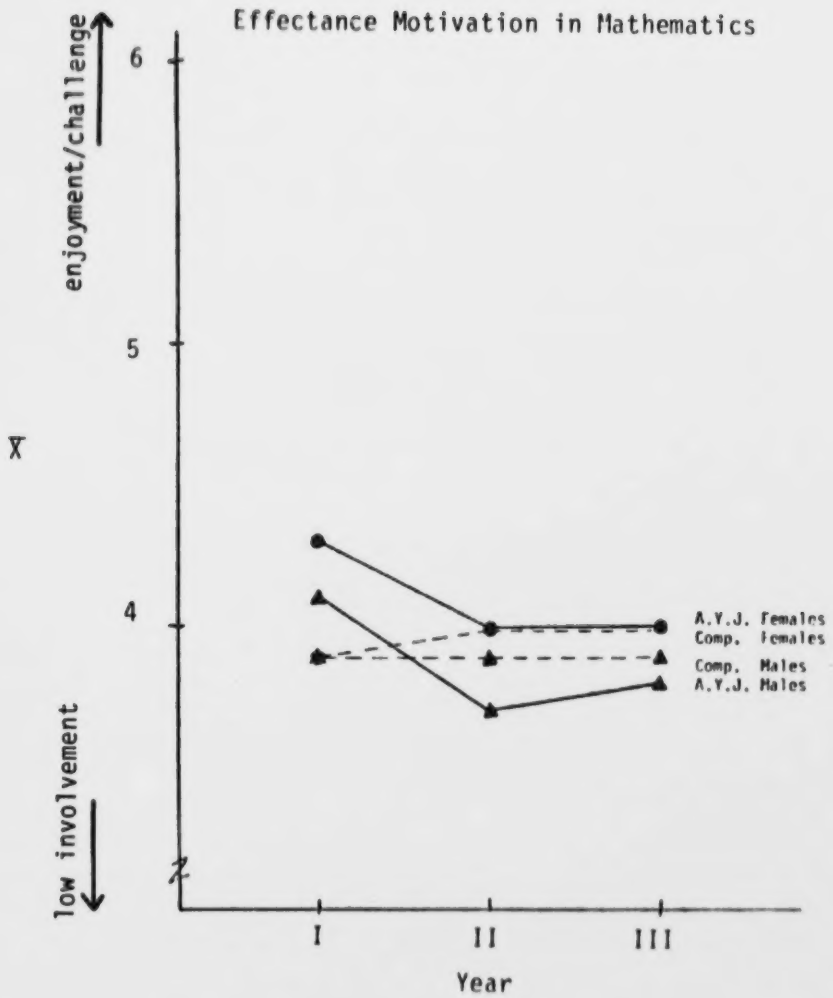
COHORT I


Effectance Motivation in Mathematics
enjoyment/challenge
6
5
4
X
low involvement
I
II
III
Year
A.Y.J. Females
Comp. Females
Comp. Males
A.Y.J. Males

APPENDIX C

Longitudinal Analyses of Mathematics Attitudes Scales

COHORT II

LONGITUDINAL ANALYSES OF MATHEMATICS ATTITUDES SCALES

The second set of analyses examining differences between males and females at the two schools was based on Cohort II students who completed the attitude measure at the end of their grade 10 and grade 11 math courses. Because it was not feasible to collect pre-test attitude data on the Cohort II students, the extent to which the groups differed initially is unknown. The total sample size for the Cohort II analysis was 371. A more detailed breakdown of this sample is provided below:

School	Female	Male
A.Y. Jackson	90	95
Comparison School	109	77

On the tables that follow, average scores are listed for each of the attitude scales. Where there are significant differences (at the .05 level) these are discussed; otherwise it may be assumed that the scores are not significantly different. The final table summarizes the overall tests of significance, as well as the significance tests for the individual attitude scales. The results are presented graphically in Figures 1 to 5.

a) Attitudes Towards Success in Mathematics

	A.Y. JACKSON		COMPARISON	
Sex	Grade 10	Grade 11	Grade 10	Grade 11
Female	5.17	5.19	5.24	5.22
Male	5.01	5.07	4.96	5.07

Female students at both schools were significantly more likely than males to anticipate positive consequences from success in mathematics. Students at the two schools did not differ significantly, nor were there significant attitude changes over time.

b) Mathematics as a Male Domain Scale

	A.Y. JACKSON		COMPARISON	
Sex	Grade 10	Grade 11	Grade 10	Grade 11
Female	5.73	5.69	5.74	5.71
Male	5.20	5.19	5.30	5.28

Females at both schools were significantly more likely than males to see math as being equally suitable for men and women. Students at the two schools did not differ significantly; their opinions did not change over time.

c) Mathematics Anxiety Scale

	A.Y. JACKSON		COMPARISON	
Sex	Grade 10	Grade 11	Grade 10	Grade 11
Female	3.87	3.88	4.15	4.09
Male	4.11	4.07	4.54	4.39

High scores on this scale reflect more positive attitudes, and hence lower anxiety levels. At both schools, females were significantly more anxious about math than males. Furthermore, students of both sexes at the comparison school expressed significantly less anxiety than students at A.Y. Jackson.

d) Confidence in Learning Mathematics Scale

	A.Y. JACKSON		COMPARISON	
Sex	Grade 10	Grade 11	Grade 10	Grade 11
Female	4.36	4.34	4.67	4.56
Male	4.74	4.70	5.05	4.88

Males at both schools were significantly more confident than females in their abilities to learn math. Students of both sexes at the comparison school expressed greater confidence than students at A.Y. Jackson. There was a tendency (of borderline significance) for confidence to decline between grades 10 and 11. This trend was due primarily to changes at the comparison school.

e) Teacher Scale

	A.Y. JACKSON		COMPARISON	
Sex	Grade 10	Grade 11	Grade 10	Grade 11
Female	4.45	4.32	4.55	4.38
Male	4.21	4.26	4.46	4.31

No significant differences were found between males and females or between schools. With the exception of male students at A.Y. Jackson, students' ratings of teachers' attitudes towards them as learners of mathematics generally became less positive over time. All students expressed very similar attitudes on this scale by the end of grade 11.

f) Mathematics Usefulness Scale

	A.Y. JACKSON		COMPARISON	
Sex	Grade 10	Grade 11	Grade 10	Grade 11
Female	4.92	4.85	5.02	4.75
Male	4.99	4.82	5.31	5.03

Males and females did not differ significantly, nor did students at the two schools. By the end of grade 11, all students rated math as significantly less useful than they had in the previous year.

g) Effectance Motivation Scale in Mathematics

	A.Y. JACKSON		COMPARISON	
Sex	Grade 10	Grade 11	Grade 10	Grade 11
Female	3.85	3.87	4.03	4.08
Male	4.03	3.78	4.15	3.82

No significant differences were found between students at the two schools. Females at both schools expressed similar levels of involvement in and enjoyment of math in grades 10 and 11. In contrast, the level of interest and enjoyment of math expressed by males at both schools declined by the end of grade 11.

h) Mother and Father Scales

FATHER SCALE

	A.Y. JACKSON		COMPARISON	
Sex	Grade 10	Grade 11	Grade 10	Grade 11
Female	5.08	5.08	4.99	4.94
Male	5.05	5.11	5.26	5.04

There were no significant differences between males and females or between schools. Students' attitudes on this scale did not change significantly between grades 10 and 11, although there was a tendency (of borderline significance) for the attitudes of comparison school students (primarily males) to become more negative over time. By the end of grade 11, all students expressed fairly similar attitudes on this scale.

MOTHER SCALE

	A.Y. JACKSON		COMPARISON	
Sex	Grade 10	Grade 11	Grade 10	Grade 11
Female	5.02	5.11	5.04	4.98
Male	4.95	5.00	5.24	4.95

No significant differences were found in the attitudes of males and females. Significant changes in attitudes occurred between grades 10 and 11; the pattern of change differed at the two schools. Students at A.Y. Jackson (particularly females) reported increased interest and encouragement by their mothers. By the end of grade 11, students at the comparison school (particularly males) reported that their mothers were less interested, encouraging and confident in the student's ability.

COHORT II

Longitudinal Analyses of Math Attitudes

Univariate F Ratios

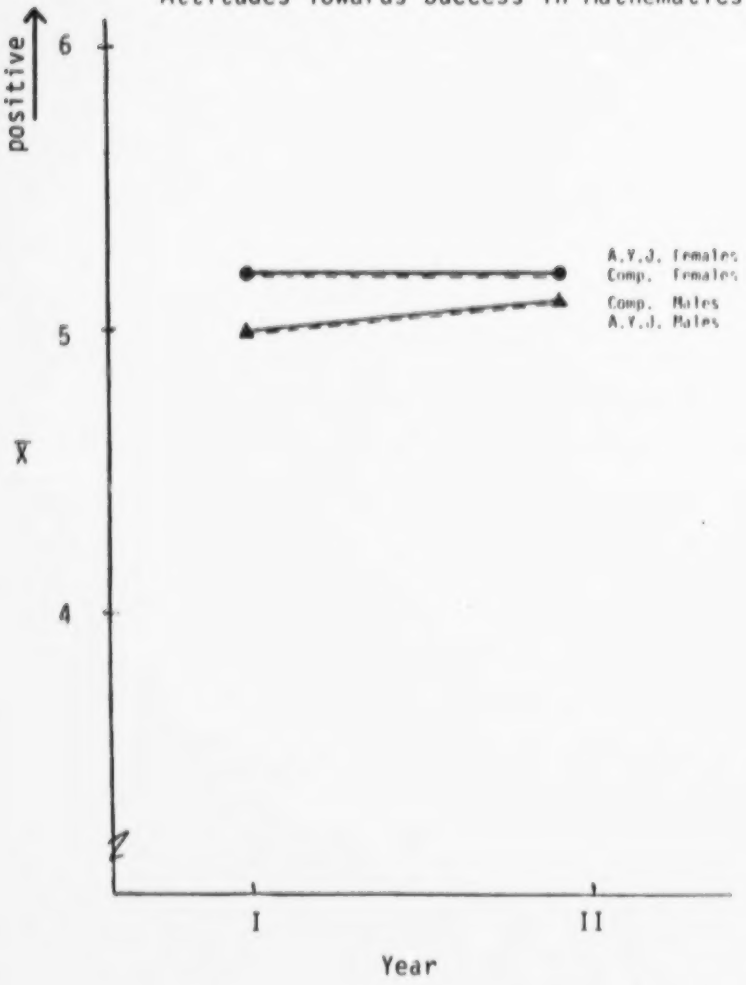
BETWEEN SUBJECTS	SEX	SCHOOL	SEX x SCHOOL
Success in math	9.23 **	.03	.52
Male Domain	69.22 ***	.90	.54
Anxiety	7.22 **	8.78 **	.40
Mother	.00	.17	1.01
Confidence	11.66 ***	5.91 *	.01
Teacher	2.05	2.09	.23
Usefulness	2.69	2.06	2.05
Effectance	.01	1.66	.29
Father	1.10	.07	1.09

WITHIN SUBJECTS	TIME	SEX x TIME	SCHOOL x TIME	SEX x SCHOOL x TIME
Success in Math	1.57	1.79	.00	.44
Male Domain	.49	.08	.00	.06
Anxiety	1.54	.53	.99	.06
Mother	1.29	1.93	5.91 *	.95
Confidence	3.55 1	.24	1.43	.02
Teacher	3.86 *	.89	1.22	.61
Usefulness	15.54 ***	.33	2.47	.21
Effectance	7.00 **	11.99 ***	.11	.32
Father	1.23	.40	3.25 2	1.35

* $p < .05$
** $p < .01$
*** $p < .001$
1 $p = .06$
2 $p = .07$

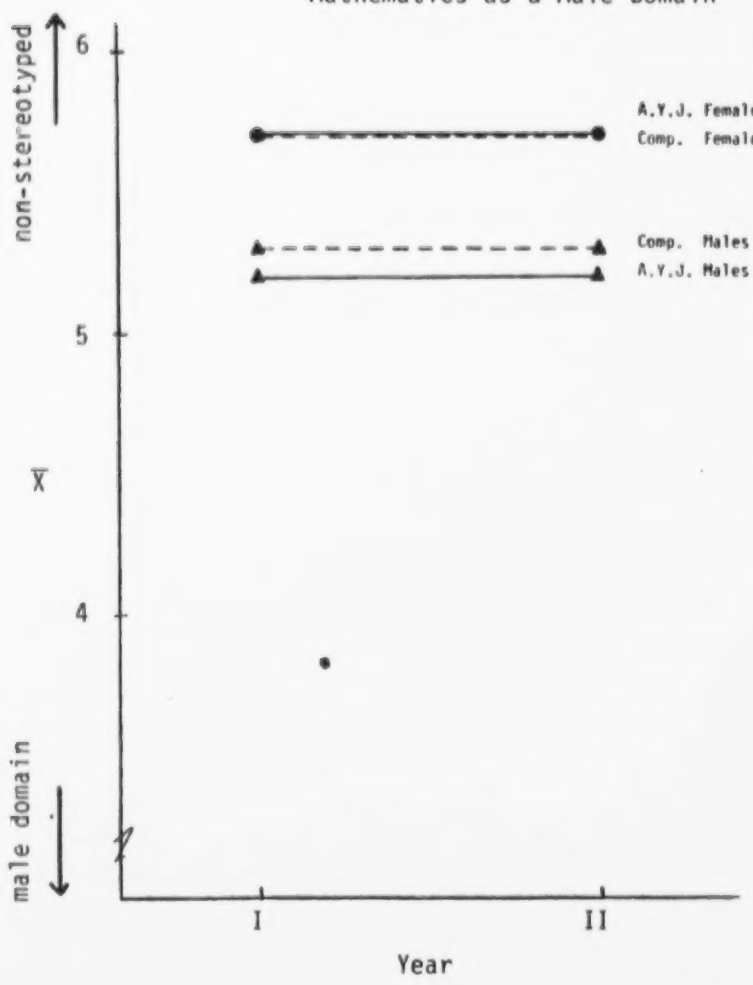
COHORT II

Attitudes Towards Success in Mathematics



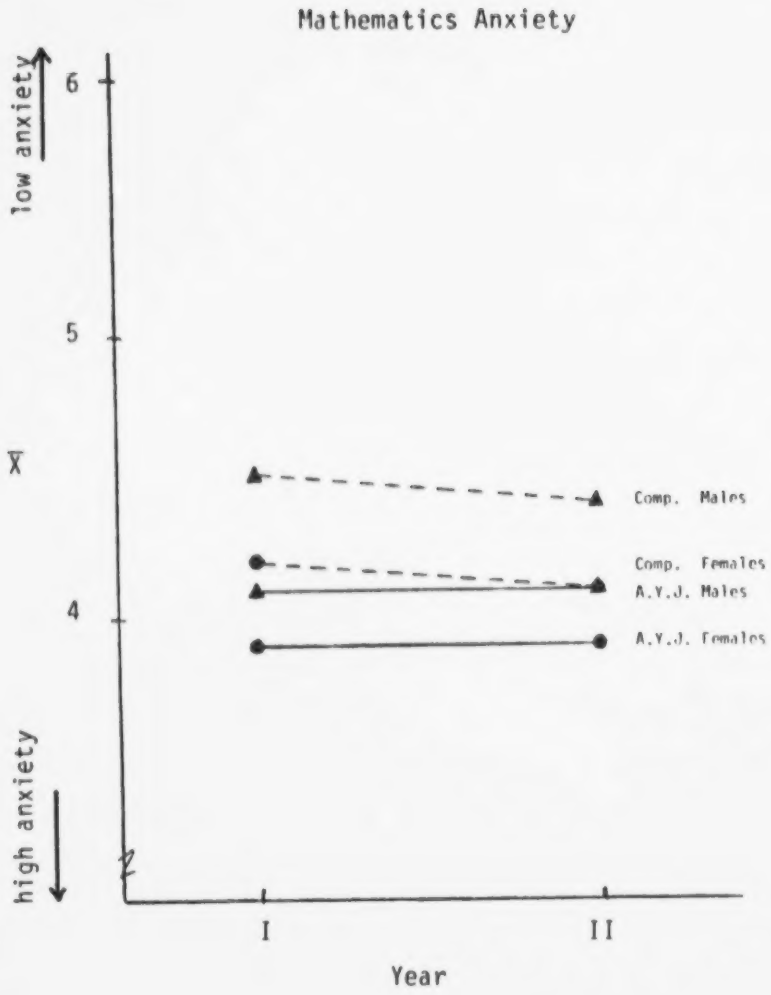
67

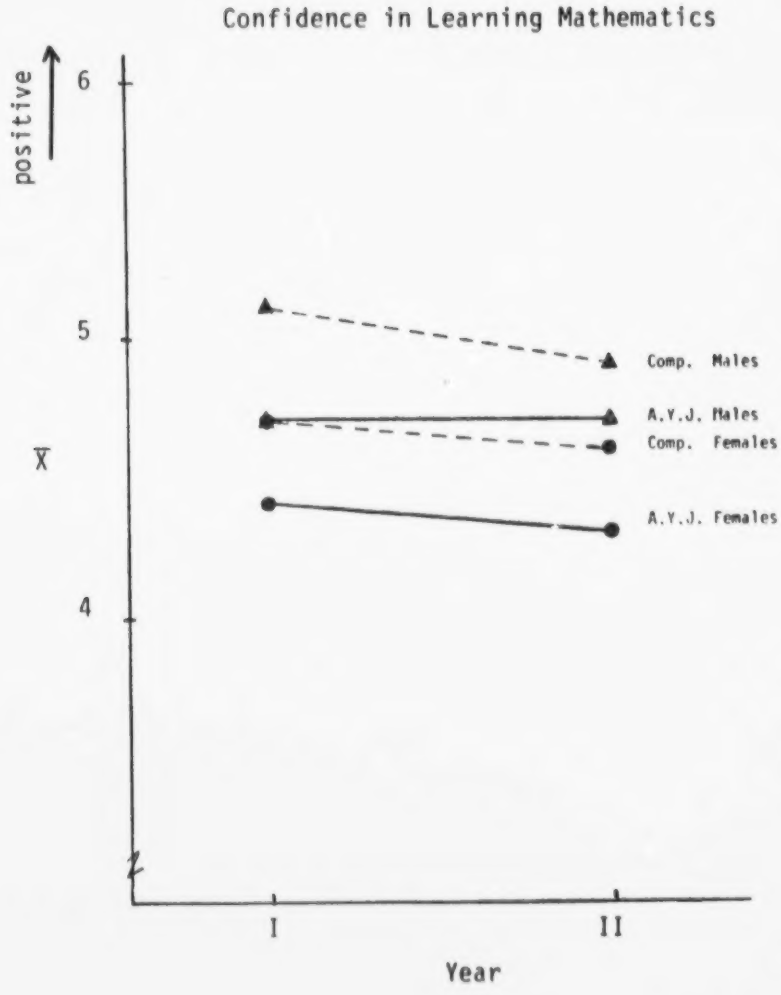
Mathematics as a Male Domain



68

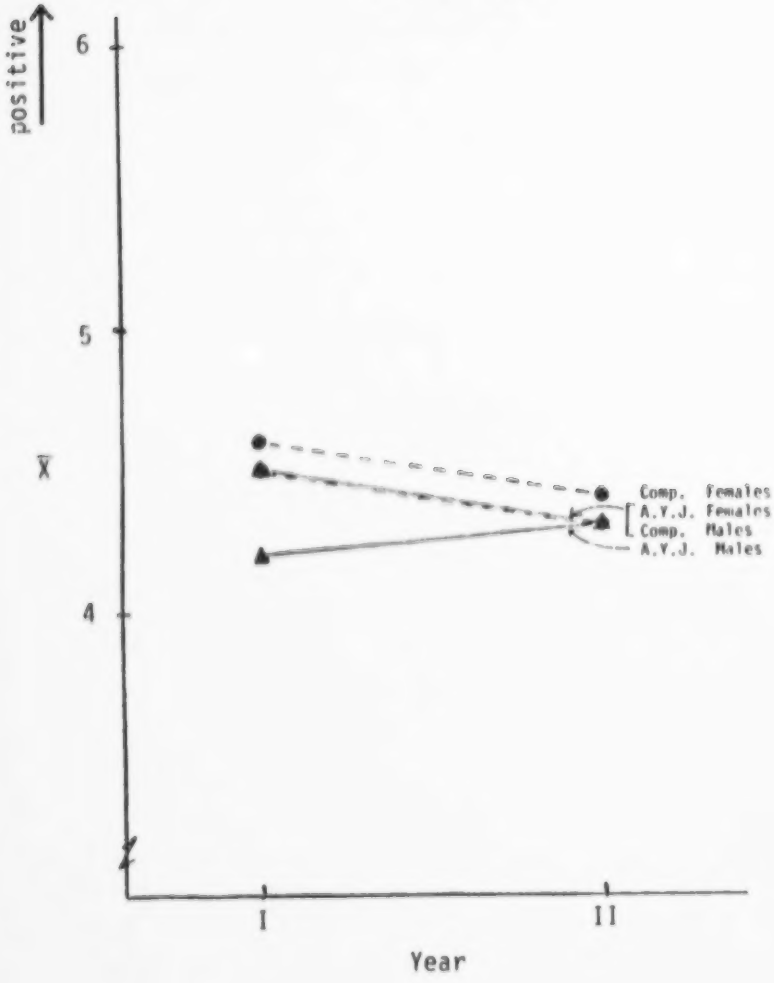
COHORT II


Mathematics Anxiety
low anxiety
high anxiety
6
5
4
X̄
Comp. Males
Comp. Females
A.Y.J. Males
A.Y.J. Females
I
II
Year


Confidence in Learning Mathematics
positive
6
5
4
X̄
Comp. Males
A.Y.J. Males
Comp. Females
A.Y.J. Females
I
II
Year

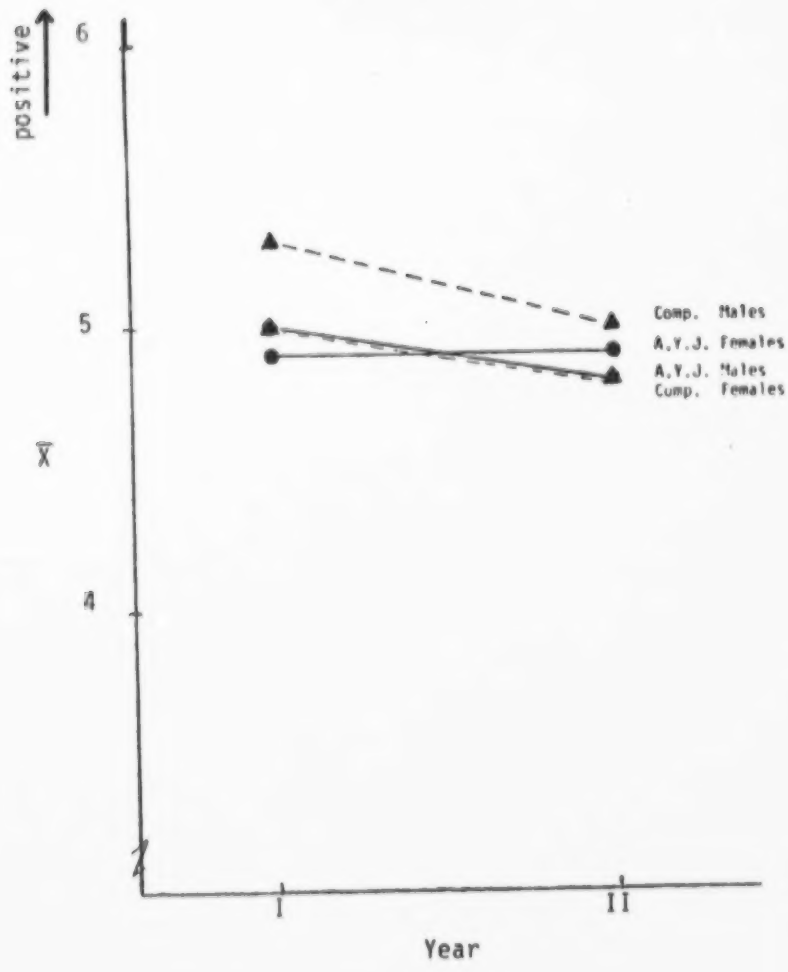
COHORT II

Teacher Scale



71

Mathematics Usefulness

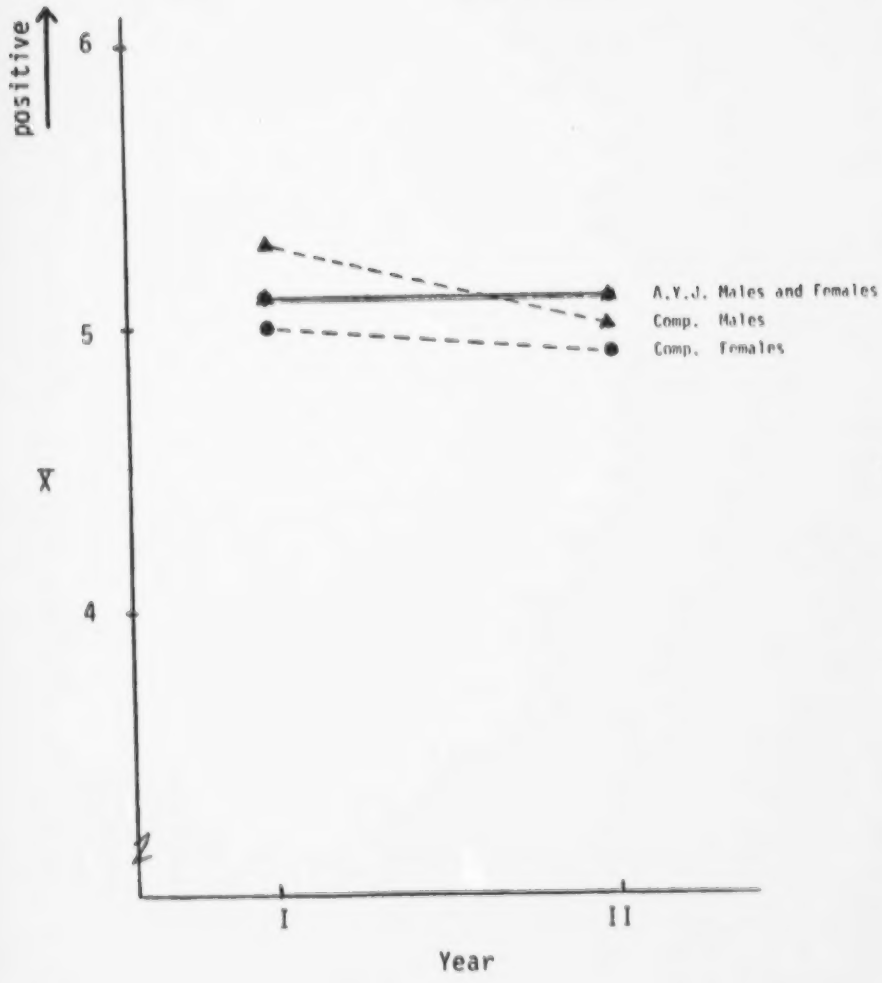


72

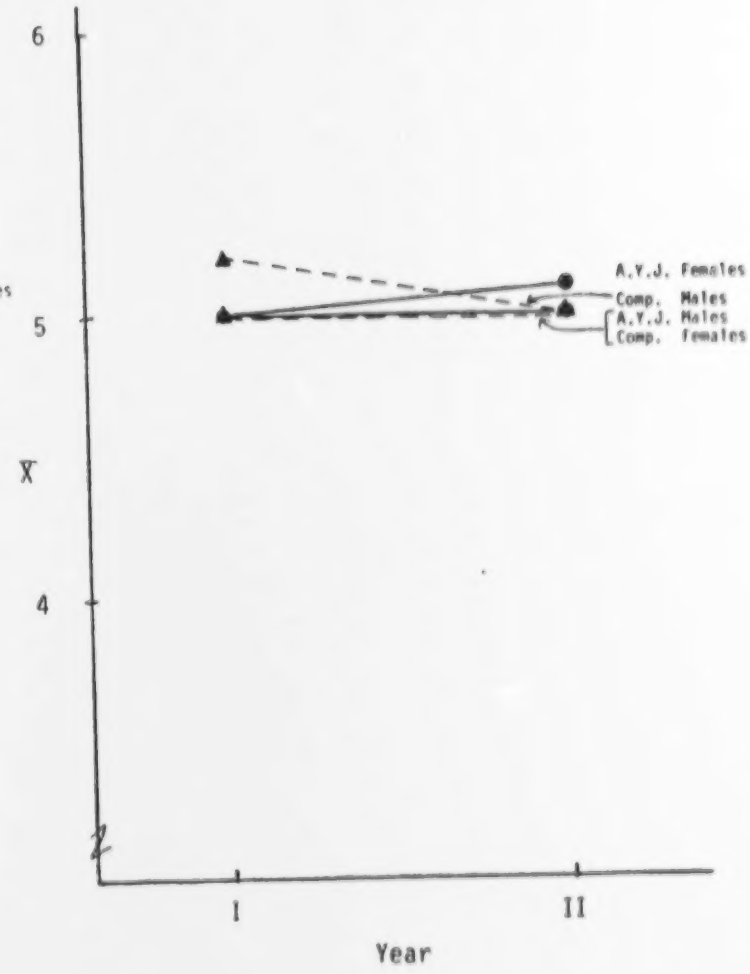
60

COHORT II

Father Scale



Mother Scale

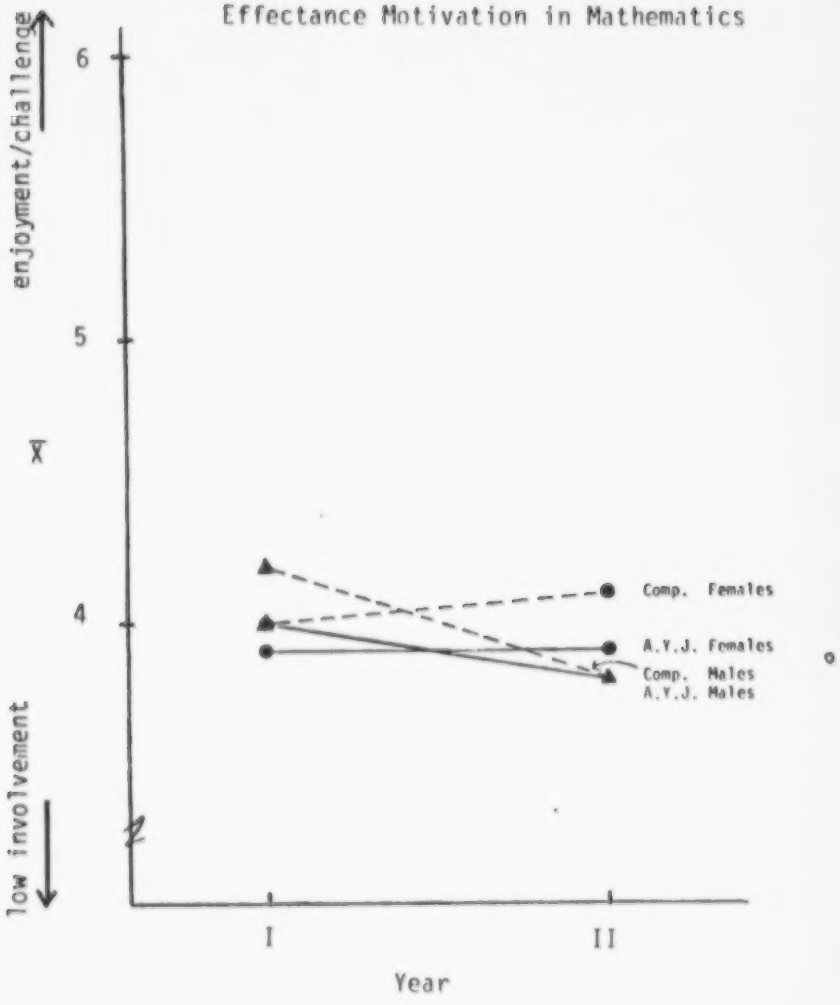


- 61 -

73

74

COHORT II


Effectance Motivation in Mathematics
enjoyment/challenge
6
5
X̄
4
low involvement
Comp. Females
A.Y.J. Females
Comp. Males
A.Y.J. Males
I
II
Year

APPENDIX D

Longitudinal Analyses of
Final Mathematics Marks

COHORTS I & II

Longitudinal Analyses of Final Mathematics Marks

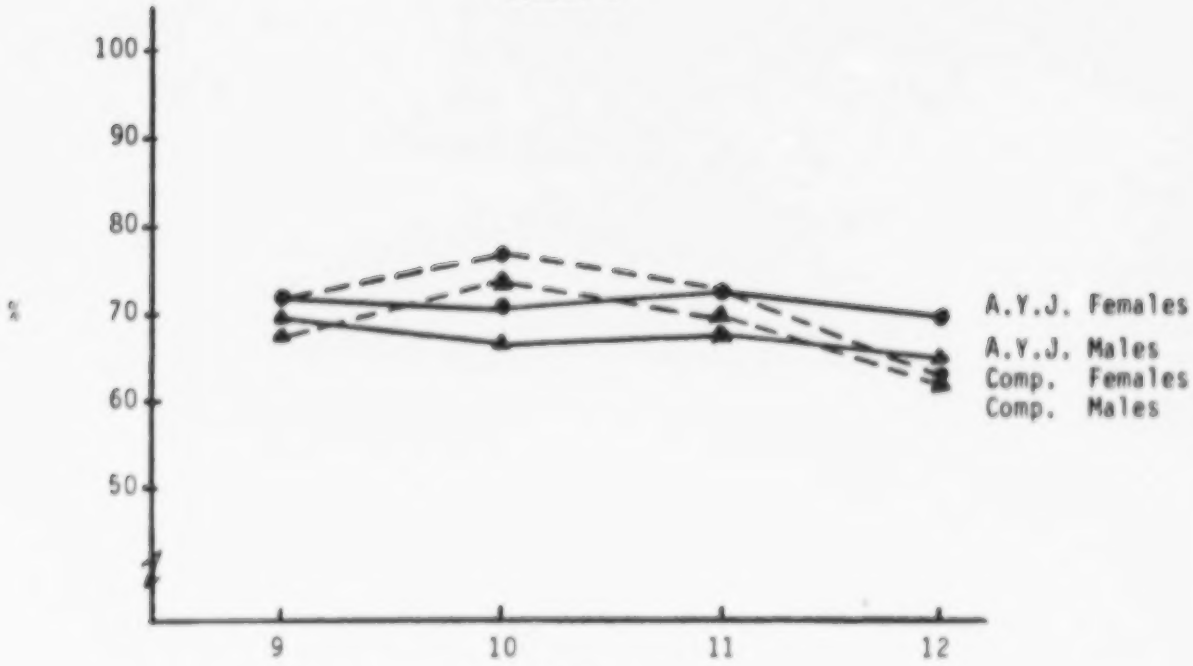
Univariate F Ratios

EFFECT	COHORT I	COHORT II
Between Subjects		
Sex	6.71 *	1.66
School	.23	13.18 ***
Sex x School	.15	.42
Within Subjects		
Time	37.27 ***	37.48 ***
Sex x Time	.06	.06
School x Time	21.99 ***	14.50 ***
Sex x School x Time	1.46	1.98

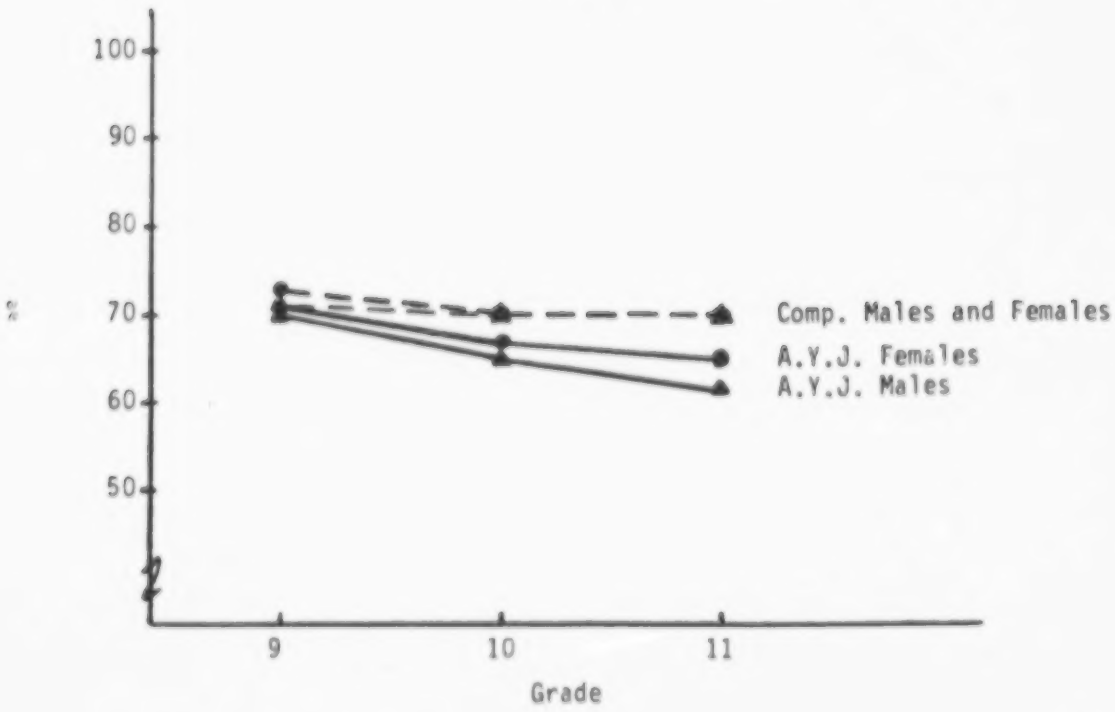
* $p < .05$
** $p < .01$
*** $p < .001$

Longitudinal Analysis of Final Math Marks

COHORT I



COHORT II



APPENDIX E

STUDENT REACTIONS TO SEX-SEGREGATED MATHEMATICS CLASSES

After rating the effect of the segregated math program on (1) attitudes toward, and achievement in math, (2) plans to take grade 13 math, and (3) post-secondary educational and career plans, A. Y. Jackson students were asked to comment. The most commonly made responses are summarized below.

	Grade 11		Grade 12	
	M (152) %	F (141) %	M (144) %	F (131) %
Positive Comments				
• fewer distractions, easier to concentrate on work and pay attention in segregated classes - easier to relate to a teacher of the same sex - easier to work with and understand students of the same sex	9	11	9	8
• students feel more comfortable, relaxed and less intimidated in segregated classes - less peer pressure, embarrassment, shyness, tension - easier to participate (ask and answer questions) - classes more enjoyable	1	14	1	5
• segregated classes help girls realize math is important and teachers care about their success - girls feel better about math and are less likely to think boys are smarter in math - both sexes will try harder to do well	2	4	-	3
• segregated classes have been generally helpful; math marks have improved	1	4	5	3
Subtotal	13	33	15	19
Negative Comments				
• segregated classes are less challenging and competitive - students don't work as hard - there is no one of the opposite sex to impress - grades have dropped - students waste more time and don't take work seriously	10	5	3	2
• segregated classes are less enjoyable and/or more boring - non-segregated classes have a better atmosphere	10	1	7	1

	Grade 11 M (152) %	Grade 11 F (141) %	Grade 12 M (144) %	Grade 12 F (131) %
. segregated classes are unnecessary and may have a negative impact - the classes are degrading for females - it is biased/discriminatory - "absurd" idea; "ridiculous" - such classes don't prepare students for reality	5	1	4	3
. segregated classes are rowdier and/or there is more gossip in class	-	2	5	-
. it is easier to work with females than males (male respondents)	3	-	1	-
Subtotal	28	9	20	6
Neutral Comments				
. segregated classes make no difference	28	28	28	40
. segregated classes have no effect on achievement or future plans	13	13	12	17
. feelings or attitudes about math have not changed	3	4	1	5
. participation in math is the same	3	1	-	3
Subtotal	47	46	41	65
. No Response	30	33	44	25

Experiences in the Program

Students at A.Y. Jackson were then asked to discuss whether their experiences with the segregated math program had been positive. The following summarizes the students' comments.

Positive Experience	Grade 11 M (152) %	Grade 11 F (141) %	Grade 12 M (144) %	Grade 12 F (131) %
. students feel more comfortable and relaxed, and less intimidated in segregated classes - easier to participate in class - class atmosphere is better and less stressful	2	18	3	9

	Grade 11 M %	Grade 11 F %	Grade 12 M %	Grade 12 F %
• fewer distractions, easier to concentrate on work and relate to the teacher - segregated classes are quieter	7	13	7	5
• segregated classes have been generally beneficial; math marks or attendance have improved	3	4	5	4
• students work harder in segregated classes because there is more competition - girls are not always asking for help (one male respondent)	1	1	2	-
Subtotal	13	36	17	18
Negative Experience				
• segregated classes are boring, dull and less enjoyable - without the presence of the opposite sex, there is nothing to look forward to	7	1	9	6
• segregated classes are less challenging and competitive - students don't work as hard without the opposite sex to impress - students don't take math as seriously	7	9	2	2
• math marks have worsened in segregated classes - some students had difficulty understanding their teachers	5	4	1	5
• segregated classes are noisier, more unruly - too much socializing and/or clowning around - less time is spent on teaching	3	1	4	-
• most people can share the company of the opposite sex and still pay attention to math	1	1	2	3
• segregation does not make sense and is a bad idea - it does not change attitudes	3	2	-	-
• it is sometimes easier to get help from peers of the opposite sex	1	-	-	-
Subtotal	27	18	18	16

	Grade 11 M %	Grade 11 F %	Grade 12 M %	Grade 12 F %
Neutral Experience				
• segregated classes have not made any difference - students can do just as well in regular classes	31	35	28	35
• students are opposed to segregated classes on principle although they feel the classes have not affected them personally	-	1	1	-
• students are not doing well in math but don't believe it is due to segregation	2	-	-	-
• students no longer notice that they are in segregated classes	1	-	1	-
Subtotal	34	36	30	35
No Response	27	26	40	30